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Agricultural Experiment Station

Agricultural Research In Review

SIXTY-NINTH ANNUAL REPORT 1955-1956

Bulletin A-87
April, 1957

Agricultural Research In Review

SIXTY-NINTH ANNUAL REPORT 1955-1956

Bulletin A-87 April, 1957
UNIVERSITY OF MARYLAND
College Park, Maryland

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In addition to state and federal funds, the research program of the University of Maryland Agricultural Experiment Station has received support during the year from many public, private and industrial organizations and individuals. It is regretted that space does not permit recognition of all sources of help, but the cooperation of all is herewith gratefully acknowledged.

Visitors will be welcome at all times and will be given every opportunity to inspect the work of the Agricultural Experiment Station in all its departments.

The Bulletins and Reports of the Station will be mailed free of charge to all residents of the State who request them.

Address:

AGRICULTURAL EXPERIMENT STATION

College Park, Maryland

I. C. Haut, *Director*

To the Governor of Maryland
the Board of Regents,
and the President of the University of Maryland

I transmit herewith the Sixty-Ninth Annual Report of the University of Maryland Agricultural Experiment Station, as established by Act of Congress, March 2, 1887, containing an account of research and experiments conducted during the fiscal year ending June 30, 1956, and a statement of the receipts and disbursements for the same period.

I. C. Haut, *Director*

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The project number is given after each progress report. The title of the project and the personnel associated with it can be found listed among the current projects on pages 73-79.

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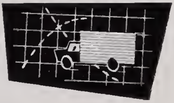
AGRICULTURAL ECONOMICS AND MARKETING



The continuing decline of net farm income emphasizes the need for more intensive research on the application of economics to farm business. Economical production and efficient marketing directly affect net farm income and consequently farm family living. Research on this phase of agriculture during 1955-56 included studies in the marketing of poultry, livestock, dairy and forest products; production and marketing of vegetables for both fresh and processed markets; economics of processing plant operations, farm credit, rural zoning, rural transportation, farm labor requirements, farm irrigation, farm insurance and agricultural taxation.

Farmers' Capital Investment Large

One of the problems facing a young man who wants to begin farming today is the large capital investment in land, buildings and equipment. This problem and the recent decline in net farm income make it advisable for farmers to analyze their capital investments more carefully.

One hundred farmers in the Piedmont area were asked: (1) how much capital they had invested in their farm business; and (2) how they acquired farm ownership.

On these 100 farms, the value of farm real estate averaged $50,617 per farm, consisting of land valued at $26,613 and buildings valued at $24,004. In addition, the value of farm machinery averaged approximately $6,500.

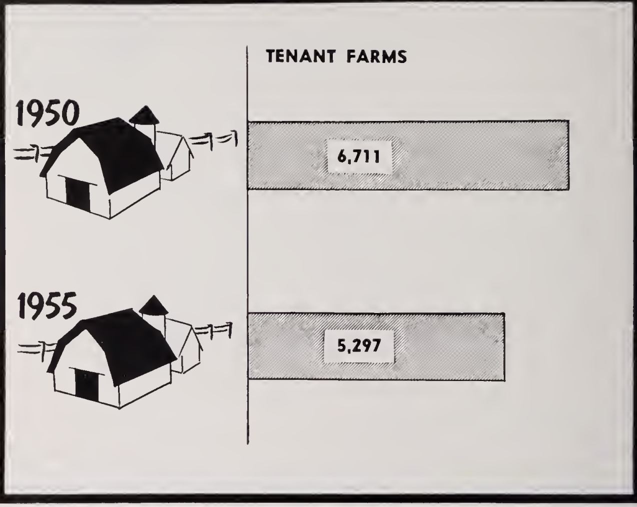
Most farmers follow five steps toward farm ownership: (1) Work on farm to gain experience in farm management and to accumulate savings; (2) buy basic machinery and equipment, while renting a farm; (3) continue to rent while acquiring a full line of equipment and foundation herd of livestock; (4) save enough money for down payment to buy their farm; and (5) repay loans to acquire full ownership.

(Project A-19-t)

Farm Tenancy Declined 26% in 5 Years

Maryland farmers are making steady progress toward owning the land they farm. According to the Census of Agriculture the number of tenant-operated farms in Maryland decreased by 1,383 or 26.0 percent from 1950 to 1955. The proportion of tenancy in the State was 16.4 percent in 1955 as compared with 18.6 percent in 1950.

FARM TENANCY DECLINES



Significant decreases in the number of tenant-operated farms were reported in all counties of the state. Calvert county ranked first among counties with 33.1 percent of all farms in the county operated by tenants. Garrett county, with only 2.4 percent of its farms operated by tenants, ranked first in proportion of ownership.

On a regional basis, Southern Maryland ranked first among the regions of the state in the proportion of tenancy, wth 29.9 percent. The Upper Eastern Shore (21.2 percent) was second. The other three regions, Piedmont, Lower Eastern Shore, and Western Maryland, had proportions of tenancy of 11.6 percent, 10.6 percent and 3.2 percent respectively.

(Project A-32-f)

Study Irrigation Costs and Returns

Many Maryland farmers are considering irrigation as a way to increase production. But before investing in an irrigation system, the farmer wants to know, "Will it pay?"

To help answer this question, 41 farmers were asked about costs and returns of irrigation. These farmers irrigated an average of 29.5 acres per farm. Their investment in irrigation equipment ranged from $960 to $14,900, with an average of $4,259 per farm. This averaged $107 per acre.

Although the analysis of the returns of irrigation is not yet complete enough to give an accurate estimate of how profitable irrigation is, it appears that an investment of $107 per irrigated acre is not too high, particularly when depreciation is spread over a period of years. With investment costs spread over a 10 year period, this would give an average annual equipment cost of $11 per acre.

Even though the investment cost appears reasonable, no farmer should purchase irrigation equipment unless he has an adequate supply of water to meet all irrigation needs.

(Project A-32-j)

Study Traffic Flow at Toll Bridges

Capital expenditures and maintenance costs for highways have increased rapidly in recent years. Funds for financing these costs are obtained from various sources. Farmers in Maryland contribute to highway improvement through motor vehicle license fees, gasoline taxes and toll bridge charges.

Traffic flow was determined at toll bridges which were so geographically located as to indicate the density of local traffic versus out-of-state traffic. From these data, the proportion of road usage by out-of-state cars as contrasted to Maryland cars was determined.

Results of this study will be analyzed to show the contribution of Maryland and out-of-state cars to highway revenue and the relationship of revenue derived from toll charges to highway usage.

(Project A-19-r)

Study Livestock Marketing Practices and Facilities

The value of livestock sold in Maryland amounts to about $35,000,000 annually. In 1955, 18,315 farms reported livestock sold. Most of the income of livestock producers comes from the sale of cattle, calves and hogs. Half of all animals sold are handled by auction markets.

Livestock marketing practices of farmers and auction markets were studied to learn more about this important source of farm income.

Results of this study indicated a need for greater efficiency in hauling livestock to market and handling the animals once they are delivered to the auction.

Farmers might benefit by pooling consignments for larger loads. They can help facilitate conditions at the market by delivering animals early enough in the day to avoid the rush

A study of livestock auction markets pointed out possibilities for greater efficiency and improved service to both farmers and auctions.

hours of unloading which usually occur between 10:00 a.m. and 12 noon.

Auction managers should be encouraged to provide more adequate unloading facilities so that stock can be handled properly when delivered.

At some of the markets veal calves and market hogs of the same class and grade are being sold in lots, that is, consignments of different farmers are grouped into one lot. This resulted in a faster sale and a higher average price to producers. The conduct of the sale can also be improved by offering services to buyers and sellers which will cause these groups to patronize the auction and insure greater buyer competition and higher prices.

Many of the animals taken to auction markets would have sold for a higher price if they had had a little more finish. This was particularly evident in the sale of heifers and steers. The average price received for these classes increased as the weight of the animal increased above 600 pounds per head. Prices of hogs were usually highest when sold at weights of 180-210 pounds per head.

The study showed that farmers selling animals for slaughter should sell them on a weight basis rather than by the head to obtain highest prices.

The average number of animals sold per farm was 60 head per year. Farmers generally did not have facilities for weighing livestock at the farm. Approximately 38 percent had loading pens and 54 percent owned trucks and were able to haul their own animals to market. The average distance animals were hauled was 18 miles.

(Project A-26-af)

Retail Egg Handling Practices Improve

Within the last decade, retail stores in Baltimore have made tremendous improvements in egg handling practices. Analysis of official egg inspection records covering the period of 1946-52 shows that eggs are more properly marked and identified as to actual quality than previously; retailers are placing greater emphasis on refrigeration of eggs in the store; there is much less evidence of either up-grading or down-grading on the part of retailers; and eggs are held in the store for shorter periods of time than previously.

At the time of the study, two-thirds of the eggs handled by retailers were kept under refrigeration. Half of the stores held eggs for less than 4 days, while a quarter of the stores reported a holding period of 4 to 7 days.

Of all eggs delivered to independent stores in Baltimore, 69 percent were supplied by wholesalers, 13 percent by hucksters, 8 percent by jobbers, 4 percent by producers and the remainder by other suppliers. In chain stores, 80 percent of the deliveries were made from the local warehouse. During the spring and summer months there was a greater tendency for independent retailers to secure eggs from hucksters and producers than at other times of the year.

Results of this study may provide information for use in consumer and retailer information programs and serve as a useful basis in the enforcement program designed to improve the quality of eggs handled by the retail trade.

(Project A-26-ak)

Study Florists' Marketing Problems

One of the major problems facing the florist industry is how to meet rising costs through greater efficiency in marketing. A study was made of flower market operations, including activities of retail florists, wholesaler commission firms, supply houses, and growers. The survey indicated a need for more cooperation between growers and marketers of flowers and potted plants.

Since the metropolitan area of Washington is a deficit flower producing area, it is necessary to import large quantities of cut flowers and potted plants to meet consumer demand. Much of this imported supply is handled on a consignment basis. Therefore, there is need for further development of uniform grades and standards to be used in marketing cut flowers. Growers and handlers felt that a market report covering market prices and supplies would be beneficial to the industry.

It was further felt that modern merchandising of flowers was needed in order to stimulate sales in this area. One possible technique is that of selling pre-packaged cut flowers. Replies obtained from 60 customers who had purchased pre-packaged cut flowers indicated that the quality of the pre-packaged product was equal or superior to flowers handled in the usual manner.

It is apparent that further research in the marketing of flowers would be beneficial to both growers and marketers. If additional work is undertaken, it should probably pertain to needed improvements in merchandising and establishing new market outlets.

(Project A-26-as)

New merchandising methods, such as sale of precut flowers, promise to stimulate flower sales.

Financing Plans Affect Returns to Broiler Growers

A recent study of the financial arrangements between broiler producers, feed dealers, and other lending agencies shows that approximately 86 percent of the broilers grown on the Eastern Shore of Maryland were grown on credit.

There were approximately 10 different financial plans being used. An analysis made of these plans showed that flocks which were grown on open account or cash arrangement gave the producer a higher average return than was possible under profit-sharing agreements. Under the open account plans the grower assumed the risks. Under a contractual arrangement, however, the dealer furnished feed and chicks on credit and received a share in the profit and the grower assumed no risk.

The profit-sharing agreements are of two types:

1. The agency sells the producer feed, chicks, fuel, litter and other items on credit with the understanding that these items will be paid for when the birds are sold. The grower furnishes labor, houses and other facilities for growing broilers. When settlement is made on the flock, the grower is guaranteed a percentage of the profit above out-of-pocket cost (generally is about 75 percent of the total). The remaining profit goes to the dealer. In most instances, the dealer assumes the loss on a flock if it occurs.

2. The agency and producer furnish the same items as above and when broilers are sold and final settlement is made, the grower is guaranteed a flat fee ranging from $40 to $65 per thousand birds started and a share (usually 50 percent) of the profit.

Under these two types of agreements, the grower generally does not assume risk beyond his investment in housing and equipment nor is he assured payment for labor.

Approximately 70 percent of the flocks included in the survey were grown on profit-sharing plans; 13.7 percent on a cash basis; 11 percent were company-produced; and 5.4 percent were grown by producers on open accounts.

Recently feed dealers have provided a type of contract where returns to growers include an incentive payment for efficiency in production. This type of contract should add stability to the broiler industry when it is more commonly used.

Much of the capital needed by feed dealers was taken from the accumulated reserves of the business or from other reserves of the dealer. When money was borrowed from cash lenders and commercial banks, the interest rate was lower than when it was obtained from feed manufacturers. Where trade credit was extended by the manufacturer, feed dealers were given from 10 to 90 days to make settlement, depending on the manufacturer.

(Project A-33)

AGRICULTURAL EDUCATION

Agricultural education research deals primarily with improved methods and techniques in teaching for high school students, young farmers and adult farmers. In addition to the two projects reported in this summary, this department is conducting research on developing a procedure to conduct an effective educational campaign to reduce the high accident rate now prevalent on farms.

How Young Farmers Become Established

Family relationships are one of the most important problems facing young farmers in becoming established today. This was shown in a survey of 150 young farmers who have become established in Maryland since World War II. The young men were equally divided between Charles, Frederick and Talbot counties and were representative of different types of farming in the state.

At the time of the survey 45 percent of the young farmers were in partnership with their fathers. Another 8 percent had been in partnership at some previous time. In addition 16 percent had worked at home for wages and 30 percent had worked at home without definite wages. Some had worked in two or more of these categories. Three fourths of the young men had worked at home at some time. This extremely high percentage is an indication that much attention should be given to farm family working relationships by the leaders of the various agricultural agencies.

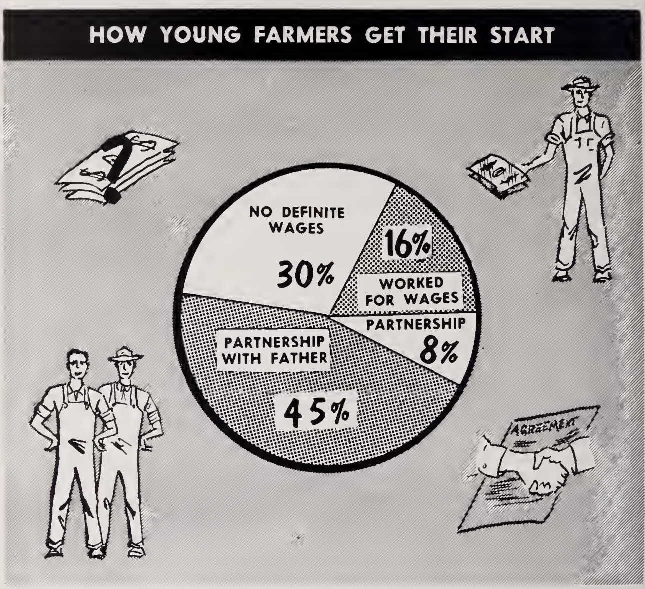
The most common reason given by the young men for entering farming was that they liked it (45 percent). Other common reasons were family influence (20 percent), opportunity to get a farm (19 percent) and a desire for freedom and independence (19 percent). Some gave more than one reason.

The most common problems encountered by the young farmers in becoming established dealt with obtaining finances, labor and land, although 15 different kinds of problems were mentioned.

Most of the young farmers solved their financial problems by obtaining loans, mostly from government agencies. Many others raised the necessary capital by successful farm operation, usually in partnership with their father.

Getting and holding labor was the major labor problem. This was solved in a great variety of ways, mostly attributed to the ingenuity of the young men.

Problems with land consisted of getting satisfactory land upon which to make a start, getting additional land to enlarge the farm business and getting higher quality land when the young farmer found he had land that was not yielding satisfactorily. The



HOW YOUNG FARMERS GET THEIR START

land problem was usually solved by searching until the land needed was located, but about half of those who had a land problem had not solved it at the time of the survey. It was evident that the problems with land were the most difficult to solve.

(Project T-2)

Compile List of Equipment Needed for Vo-Ag Classes

Good teaching depends primarily on the skill of a teacher in presenting material clearly, accurately and forcefully. But considerable equipment is needed to aid the teacher in doing his job adequately. A complete equipment list for classroom activities was prepared to save teachers time and provide them with a ready reference.

To arrive at sound completed lists, basic lists were first assembled. Sources used as a guide were previous lists used in Maryland. Current lists from other states, vocational agriculture textbooks and inventories from departments of vocational agriculture in Maryland. The basic lists were then checked by about one-fourth of the Maryland teachers of vocational agriculture for validity, additions and refinements.

The completed lists were organized into four major groups: Crops and Soils, Livestock, Science, and General Classroom.

(Project T-3)

AGRICULTURAL ENGINEERING

In the application of engineering to agriculture one of the phases of Agricultural Engineering research is the improvement of existing machinery to do a more efficient job with less labor and less damage to the crop, and the development of new equipment for growing, harvesting, handling or processing farm crops. An important part of this work is the design and construction of special equipment to make certain types of research possible both in Agricultural Engineering and in many other departments of the Experiment Station.

Shelled Corn Dried With Unheated Air

The work with drying shelled corn with unheated air was repeated to determine annual differences which might occur. Rate of air flow had more effect on the drying rate when the blower operation was humidistat-controlled than where the blowers operated continuously. This may be due to the fact that, while the higher air flow rates during continuous operation dry faster when the air is dry, they also tend to add more water when the air is humid.

Again slight mold was found on broken kernels in the humidistat-controlled bins. All but one of the bins were dried to below 14 percent moisture in 10 days.

(Project R-17)

Tobacco Curing Tests Continued

Tests were continued on the use of supplemental heat and forced natural air for curing tobacco during high humidity weather.

Tobacco was cured in constant temperature and humidity compartments. The same dry bulb temperature (85° F.) was held constant in the 5 compartments. Constant relative humidities of 70, 75, 80, 85, and 90 percent were held in the various compartments. Preliminary observations indicate the best cure at this temperature was 80 percent relative humidity.

Due to heavy damage to the tobacco by a hurricane, it is felt that this crop should not be used for year-to-year comparisons of curing under controlled conditions.

(Project R-11-d)

Design and Build Machine for Nematode Control

A treatment to control nematodes in strawberry plants was developed by pathologists of U.S.D.A. To apply this treatment on a commercial scale a machine was designed and built to treat about 9000 plants per hour.

Developing Pneumatic Handling System for Chopped Forage

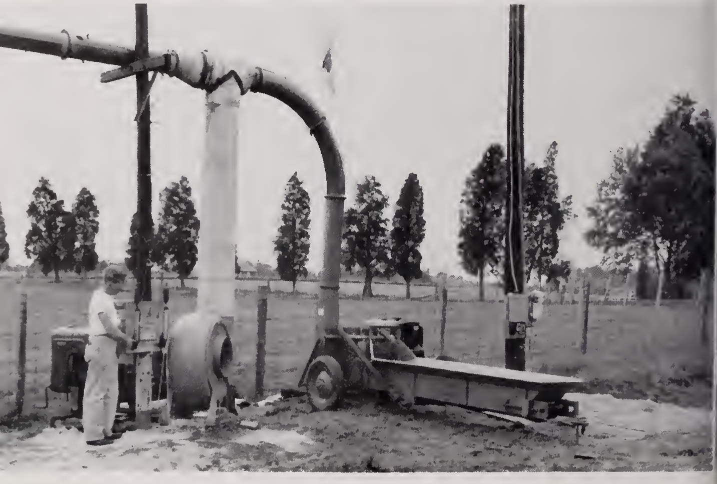
The aim of this project is to find a practical method of placing partially cured chopped hay on a hay drying system with the use of air as a means for handling. This year's work has centered around the method of introducing chopped hay into an air stream. Several methods are being tried and those showing promise will be refined in an attempt to find the most practical method. Considerable time was spent on the use of a commercial forage blower to deliver the chopped hay to the air stream from a large volume fan.

This system is designed so that the hay from the forage blower passes through a 90 degree elbow into a chamber that receives air from the volume fan. Hay enters the chamber in the center of the air stream. The velocity of the air stream can be changed by adjusting the size of the opening from the volume fan. Theoretically, if the air stream velocity is high enough, it will assist in delivering the hay from the forage blower.

Most of the necessary equipment has been obtained to determine the rate of handling chopped hay, air pressures and volumes of air. After the problem of introducing chopped hay into the air stream is solved, our attention will be centered on determining the velocity of air necessary to adequately float hay and the volume of hay a given volume of air will carry.

(Project R-16 and NE-13)

Forage blower and volume fan, showing section used to introduce partially cured chopped hay into the air stream. When this part of the equipment is perfected, work will center on air velocity.



AGRONOMY

Research in the Department of Agronomy includes studies in field crops and soils. Because these two areas of investigation are so closely related, many of the projects within the department are conducted jointly by the crops and soils staff. Close cooperation is also maintained with other departments within the Agricultural Experiment Station as well as with the soils and field crops units of the Agricultural Research Service of the United States Department of Agriculture. A team approach to the solution of many of our agronomic problems today is essential to an effective research program.

The diversity of experimental work within the department is indicated by the brief reports of projects presented in the following pages. This program of research is ever changing in order to most effectively meet the needs of Maryland farmers.

A reasonable proportion of the experimental work of the Department is of an applied type and is directed toward the immediate solution of field problems. A good nucleus of research projects in both crops and soils is of a more basic nature, which serves as a basis for future practical developments. Proper balance of basic and applied research is essential to a sound and effective, long-time program.

This work is conducted in the laboratory and greenhouse at College Park, and in the field at various locations throughout the state. Major centers for field research are the Plant Research Farm, near College Park; the Tobacco Experimental Farm, near Upper Marlboro; the Willis Farm, near Trappe; and the Kent County Experimental Farm, near Kennedyville. When it is important to have other soil types and climatic conditions represented, tests are conducted in cooperation with individual farmers at other locations in the state.

Whether it is basic or applied research in crops or in soils, the primary objective in agronomic research is for maximum yields consistent with efficient and economical production. Emphasis at times has tended to be too much on the highest possible production without due regard to efficiency. The narrowing cost-price ratio has helped to change this picture, and a sound and sustained agriculture in the future will become more and more dependent upon economical and efficient farming operations.

Increased Soybean Acreage Emphasizes Need for Research

The rapid rise in soybean acreage since 1952 has focused increased attention on soybean research in the department. This project, which is conducted cooperatively with the Forage and Range Section of the Agricultural Research Service at Beltsville includes variety testing, a variety and date of planting study, and early evaluation of material from the breeding program.

Soybean varieties of group IV maturity have often exhibited poor qualty seed when grown as full season varieties in the central and southern parts of the Eastern Shore. Later varieties (maturity groups V and VI) have exhibited much better seed quality, but have been susceptible to lodging. A variety and date of planting study at Trappe in 1955 indicated time of planting had little effect on the maturity date of Dorman and Lee varieties. This is in contrast to 1953-54 results at Beltsville and Marlboro, when there was a direct relationship bewteen date of planting and date of maturity for both early and late varieties. Selection among and within crosses was continued in the search for a more desirable variety of group V maturity.

(Project B-43)

Progress in Sweet Corn Improvement

Sweet corn has been an important commercial crop in Maryland for a century. In recent years 30,000 to 40,000 acres have been grown, with an annual farm value of about 1 1/4 million. The purpose of this project has been to find or breed the most suitable hybrids. As a result several good hybrids for each of the maturity and color classes can be recommended.

In addition, certain general conclusions can be drawn from the work. Maturity is one of the most important varietal characteristics. Short season hybrids are less productive than medium season and late season hybrids. No hybrid has a monopoly on all good characteristics, and none tested to date exhibits maximum possible resistance to all troublesome diseases and insects. Some of those being used in Maryland have good resistance to bacterial wilt. A few have shown more freedom from ear-worm damage than others, but satisfactory control through breeding seems a long way off. Improvement in sweet corn will continue, but currently available hybrids are good enough to permit raising state yields if good cultural operations are generally used.

(Project B-44)

Some Corn Hybrids Show Drought Tolerance

Due to severe drought, followed by hurricanes, the season of 1955 was trying for corn breeding and testing. At College Park drought limited yields to 30 to 50 percent of normal. Despite short fodder and small ears practically all corn at this location was root lodged. Several hybrids with the single cross, WF9 X 51A, in their pedigree seemed to show considerable drought tolerance at several locations. No entries were able to stand up against the hurricanes. Lines that lodged before physiological maturity developed many soft cobs after lodging.

(Project B-50)

Tayland Tops In Wheat Tests

As the wheat acreage decreased, choice of varieties becomes more critical. This project continues to supply performance data on new varieties. Practically all promising selections made in the soft red winter wheat area pass through the nursery at College Park. The few that survive the nursery tests pass into regional drill plot tests at several locations in the state. In 1955 the new variety, Tayland, had the best average grain yield in tests at 5 locations (43.2 bushels per acre). It was closely followed by Thorne, Anderson, Leapland, Nu-Del and Atlas 50. At College Park, Seneca continued to out-perform its widely grown relative, Thorne. Knox, an early, short, stiff-strawed newcomer from Indiana also looked good.

(Project B-66)

Continue Search For Improved Feed Grains

The importance of feed grains continues to increase in Maryland. This project includes an up-to-date evaluation of new selections of winter barley, winter and spring oats and winter rye.

Kenbar and Hudson barleys continue to out-yield Wong, but both have beards that often are incompletely removed in threshing. Colonial 2 is practically beardless and has given good yields, but is very susceptible to loose smut.

LeConte winter oats stood up much better than other entries in the 1955 tests.

Although the performance of spring oats continues to be erratic in Maryland, availability of improved varieties is proving helpful. Mo. O-205 has a good 2-year record.

(Project B-67)

Research agronomists explain results of their work to visitors touring the Plant Research farm.

New Project Aimed at Developing Mildew-Resistant Barley and Wheat

In recent years heavy mildew infection has been observed on susceptible varieties of winter barley and winter wheat grown in Maryland. When severe, this disease reduces the effectiveness of leaf tissue and thereby seriously reduces grain yields. Good resistance can be bred into susceptible varieties, and an attempt is being made to improve otherwise adapted varieties in this respect. Because of the importance of this problem in Maryland, a new project was initiated in 1955 to study the mode of inheritance of this disease and to develop resistant varieties.

(Project B-69)

Improved Red Clover Needed For Use on Eastern Shore

Red clover continues to be an important legume in the agriculture of Maryland. However, we still do not have a red clover variety that will perform well throughout the state. Pennscott and Kenland varieties are satisfactory in the western and northern counties of the state, but neither perform well on the Eastern Shore, where red clover is included in many of the crop rotations used. Local strains do very well in these areas, but seed supplies are inadequate for farmer needs. Work is now under way to combine the desirable characteristics of several superior local strains with lines which have been selected for resistance to southern anthracnose and have shown a high degree of perennialism.

(Project B-56-a)

Breed Improved Ladino For Tests in Northeast

Efforts to improve Ladino clover through breeding have increased. Experimental findings and farmer-experiences have shown that although this legume possesses many advantages for pasture use, it lacks sufficient persistence, drought resistance, and competitive ability with tall-growing grasses.

A number of superior plants remaining after several thousand have been eliminated will be evaluated in

One of the groups from the meeting of the Northeastern Society of Agronomists inspect forage seedling establishment plots at the Plant Research farm. Equipment is for microclimatic studies.

various locations in the Northeast on the basis of their progeny performance. A number of others are being screened for character expressions which contribute to longer life of the plants and greater yield and competitive vigor.

(Project B-56-g)

Improved Late-Maturing Orchard Grass in Making

A study just completed showed that late-maturing strains of orchard grass grown with alfalfa for hay will produce substantial yields of high quality. Therefore, considerable emphasis has been placed on the development of late-maturing types to be used primarily for hay.

Progeny performance of several late-maturing plants has significantly exceeded commercial varieties of similar maturity. The latter are mostly of foreign origin. Improved lines which perform well in other states cooperating in a regional study of these advanced breeding materials will form the basis for new experimental strains.

A number of orchard grass plants have been isolated which are superior in aftermath growth, leafiness, vigor, and resistance to leaf diseases, especially leaf rust. These will be tested further.

(Project B-56-i)

New Pasture Mixtures Included in Trials

Over the years, there has been a steady upward trend in the number of dairy and beef cattle in Maryland. Thus, the total feed needs for the state have increased. The search for more productive pasture combinations which are adapted to a wider range of conditions becomes increasingly important if these forage needs are to be provided economically. There is a considerable acreage in the coastal area of the state which could support many more head of livestock. Much of this area is made up of light, sandy soil, low in fertility and water holding capacity while other areas are poorly drained. Forage combinations which are very productive in most other areas do not perform well on many of these soils. In order to further test combinations which may be suited to these conditions, Midland bermuda grass with crimson clover and reed canarygrass-ladino clover-red mixtures have been included in the grazing trials at the University of Maryland Tobacco Experimental farm in Southern Maryland.

(Project B-56-j)

New Forage Strains And Varieties Promising

Variety tests of alfalfa, Ladino clover, red clover, orchard grass, tall fescue, bermuda grass, sorghum, sudan grass, pearl millet, tall oat grass and smooth bromegrass were conducted at eight locations. New variety and strain tests of crimson clover, annual lespedezas, and vetches were established for study in the coming year.

Alfalfa acreage has increased in Maryland from 67,000 in 1950 to 90,000 acres harvested in 1955. Much of this increase has been due to availability of seed of persistent and productive varieties such as Williamsburg and Narragansett. Excellent performance of such varieties in experimental plantings throughout the state has led to their widespread use by Maryland farmers. DuPuits alfalfa, of French origin, has been very productive for 2 harvest years in several trials, although its susceptibility to crown and root rots would seem to limit its use as a long-term stand. If its vigor and productive ability continue to show up under continued testing, DuPuits may be of considerable value as the legume component in shorter rotations on well-drained land.

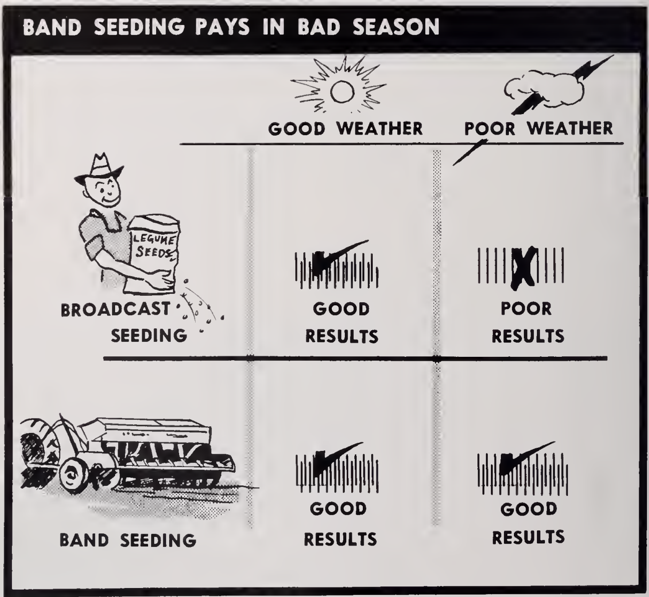
A hybrid pearl millet, which has shown considerable promise as a summer annual pasture, has been productive as a silage crop in preliminary trials.

Performance of Midland bermuda grass has continued to be promising. Additional tests comparing it with other varieties of bermuda grass have been established at several locations, and Midland bermuda grass is being compared with several other pasture grasses for beef production.

(Project B-56-l)

Band Seeding of Forages Continues to Show Promise

Forage seedings are expensive to make. When farmers can't get satisfactory stands, they must either get by with a poor mixture or go to the ex-


BAND SEEDING PAYS IN BAD SEASON

pense of making a new planting which may have to be delayed 6 months to a year.

In order to learn more about the problems of establishment of forage species and to obtain answers to these problems, tests are being conducted on the effects of seed and fertilizer placement, rates, and ratios on seedling establishment. Ths work is being carried out in cooperation with the U.S.D.A. Agricultural Engineering Research Branch, Beltsville, Maryland. At the same time, a study is being made to learn more about the management of these forage plantings during the establishment year when seeded alone or with a companion crop.

In the spring of 1955, good stands were obtained for all treatments where seed and fertilizer placement were varied. In contrast to the previous year's results, there appeared to be little advantage to banding either the seed or the fertilizer. The 1956 spring seedings are showing a distinct advantage for band seeding. From the results thus far, the greatest advantage for band seeding appears to be where conditions for establishment are less favorable.

In the management of seedling stands, frequent clipping (two or three clippings) resulted in better orchard grass-Ladino clover stands while alfalfa-bromegrass and birdsfoot trefoil-timothy stands were best when only one clipping was made. When competition from either weeds or companion crop was severe, stands were reduced substantially. This was particularly true in the case of Ladino clover.

(Project B-56-m)

Better Management Improves Alfalfa Quality

Alfalfa acreage in Maryland has increased from 67,000 acres in 1950 to 90,000 acres in 1955. Seed availability of superior varieties has largely accounted for this increase.

Since alfalfa is being used more widely by Maryland farmers, more information is needed concerning its management in the humid East for maximum yield of high quality forage. Much of the high feeding value of the first harvest of alfalfa is lost as a result of lodging and leaf loss.

Harvest in the early bud stage of growth will produce a higher quality hay. However, yields may be lowered and stands damaged by such treatment. Yield of forage and persistence of stand may also be affected by differential fall cutting, especially when a fourth harvest is made instead of the usual three. These factors are now being tested in an experiment which is in its second harvest year.

Preliminary results indicate that spring harvests in the early bud stage of growth have not reduced stands. Yields were slightly lower, but the quality of forage was higher.

When only three harvests were made, little difference in yield or stand persistence was found between early, medium or late fall harvests. However, when an early third harvest was made and then a fourth harvest taken, yields were slightly higher, but the vigor of the stand the following spring was noticeably lowered. Seeding a grass with alfalfa reduced lodging damage.

(Project B-56-n)

Forage Crops Need Proper Management

Management of established forages is important if the maximum benefits are to be obtained from these crops. A tall fescue management experiment demonstrated that Ladino clover stands could be maintained in association with tall fescue over a longer period of time when the sward was periodically clipped to a height of approximately 2 inches. Frequent harvesting had little effect on tall fescue while the alfalfa component was decreased and the Ladino clover component was increased by this treatment.

In a study where nitrogen was added to five grasses grown alone, yields were substantially increased. However, when the same grasses were grown with a legume and nitrated with the same amount of nitrogen, the increase in yield was small and the clover component was essentially lost. Where Ladino clover was seeded in mature stands of grasses, establishment was poor at high nitrogen levels, but was good where residual nitrogen was low. Three or more nitrogen applications per year on Kentucky bluegrass resulted in a substantial carry-over of nitrogen.

(*Project B-56-o*)

Ladino clover can be established (as shown on left) in mature grasses if nitrogen levels are low.

Weed Control Research Helps Explain Action of CIPC

Control of weeds in crops through the use of selective herbicides is a practice that has been of unusual benefit to a high percentage of farmers. Much of the weed control research to date has been of an applied type from which have come general recommendations for the use of new chemicals. Fundamental investigations are needed to provide sound direction to future research programs and farm practices.

Basic studies were continued to further clarify the mechanism of action of the selective herbicide CIPC. Soybeans were grown in the greenhouse and treated with CIPC, then analyzed to determine effects of the herbicide on chlorophyll content and the carbohydrate mechanism of these plants.

Principal results showed that treatments generally increased amounts of invert sugars and reducing sugars in the plants. Total sugars also increased, particularly when the high (8-pound) rate was used. Treatment with CIPC had no great effect on chlorophyll content of soybean plants. These results show the same trend as noted last year for corn.

Another phase of this study was concerned with the effect of applied water and soil type on movement of CIPC in soil. Three soil types were used—a clay loam, a loam, and a fine sandy loam—each treated with two or eight pounds of CIPC and varying amounts of water simulating rainfall.

In general, where the 2-pound-per-acre rate of CIPC was used, CIPC did not move out of the surface one-half inch of soil, even after eight days. With the 8-pound rate, there was a progressive movement of the chemical downward in the light soil. This was not true in the heavier soils. Apparently soil texture had a much greater effect on the movement of CIPC than the amount of water applied. In the lighter soil where CIPC did move, rate of water applied had a pronounced effect, since the most movement occurred in soils that received the most water.

(Project B-58-d)

Improved Seedbed Management Increases Production, Cuts Costs

Farmer-acceptance of better production methods for tobacco seedlings has been a large factor in reducing cost of production within the past seven years.

Tests show methyl bromide provided control of weed seeds and plants, insects, nematodes and some soil-borne diseases. It had no adverse effects on soil stability or soil reaction. This permits use of permanent bed sites, which in turn justifies the use of irrigation equipment.

Calcium cyanamide, trade name "Cyanamid," provided good weed control for 3 years, but then annual grasses multiplied to an extent which necessitated moving the beds. Also, black root rot, a soil-borne fungus favored by high soil reaction, increased in the same period.

The use of frequent supplemental irrigation resulted in nearly doubled yields of seedlings. A combination of better management methods has resulted in an estimated annual saving of $1,500,000 to the tobacco farmers of Maryland. Also, use of out-of-state plants has ceased, thus removing the risk of introduction of diseases which often accompanied that practice.

(Project B-59)

Tobacco Yields and Quality Improved By Better Fertilizer and Planting Practices

Economic pressures and acreage controls are becoming potent factors in the search for higher yields and better quality of tobacco.

Higher fertilizer rates, and closer placement can be combined with increased plant population to good advantage. A band application of 1500 pounds per acre of 4-8-12 fertilizer at planting time, with a plant spacing of 22 inches in 40-inch rows (7100 plants per acre) was the best paying combination, resulting in an acre return of $807.

Fewer pounds of lower priced tobacco were obtained with 750 pounds of the same fertilizer.

Sidedressing all the fertilizer at 21 days after planting decreased returns by more than $100 per acre.

Where all factors were at their minimum levels, the gross return was near the state average of $400 per acre.

Practical limitations may prevent reaching the ultimate goal of doubling the acre return, but much improvement is possible.

(Project B-60)

Cover Crops Increase Tobacco Yields and Value

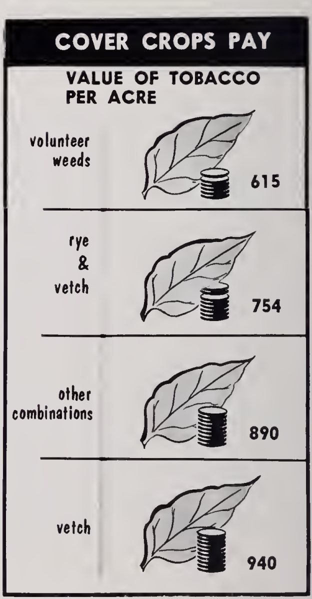
Winter cover crops for tobacco in a one-year rotation have proved a valuable practice in a 5 year test.

Tobacco quality, as indicated by price per pound, was generally highest following cover crop combinations such as vetch and wheat or winter oats, rye or ryegrass. These same combinations, with the exception of rye and vetch, resulted in average acre returns for 1953 and 1954 of $890. Rye and vetch fell to $750 in acre return, possibly due to slower decomposition of plant residues. Vetch alone gave the highest yield and an acre value of $940, but quality was somewhat lowered.

Pounds of nitrogen returned to the soil by tops and roots of cover crops ranged downward from 188 pounds per acre with vetch, 150-160 pounds with the better combinations, 120 pounds with rye and vetch, or with crimson clover alone, to about 50 pounds with either wheat or ryegrass alone, and 27 pounds with volunteer weeds. The acre returns from cover crops in which legumes were omitted were about $500 per acre for ryegrass and $600 per acre for wheat or weeds.

Fertilizer was uniformly applied as a row application at 1000 pounds per acre of 4-8-12 formulation.

(Project B-68)



Study Seed Production and Labeling Practices

Practices that will be of help to Maryland farmers in the production and use of better quality seed were investigated. Seed cleaning is an important phase of a seed production program. Samples drawn in the spring of 1956 showed recleaned seed being offered for sale which contained Johnsongrass and as high as 55 percent dodder.

Samples of seed offered for sale in Maryland were collected and analyzed to determine the accuracy with which they were labeled. A total of 666 samples were collected from July 1, 1955 to May 15, 1956 at 185 different retail dealers in the state. Of this number approximately 50 percent were violations of the state seed law with respect to labeling requirements. Eight lots of seed were unfit for planting purposes as determined by the analyses made in the Seed Laboratory.

From July 1, 1955 to May 15, 1956, 2908 samples were submitted by farmers and seedsmen in Maryland for testing. Two hundred and thirty-six lots of tobacco seed were cleaned, tested or treated.

Application of these findings will give farmers of Maryland an opportunity to evaluate more accurately the quality of seed they are purchasing and planting. A knowledge of the quality of the seed as to purity and germination, as well as freedom from noxious weeds, is of utmost importance to seed users. Such information will help reduce crop failure and the introduction of troublesome weeds.

This work should stimulate a greater interest in and appreciation for quality seed and for proper labeling of seed. Practical application of the findings will be of real benefit to seedsmen. Efforts to learn more about reasons for seed of low quality and ways in which quality can be improved have already found ready acceptance among seed dealers.

(Project N-10)

Ammonia Doesn't Cause Poor Soil Tilth

Extensive field and laboratory tests conducted during 1955 indicate that ammonia has little effect on soil physical properties. Thus, it appears that it can be used without fear of causing poor workability of the soil. This is important because ammonia is a cheap source of nitrogen and is being used in increasing quantities by Maryland farmers.

Other work on soil aggregation indicates that the porosity of soil aggregates increases with decreasing water stability of the soil aggregates. Further research is in progress on the porosity of soil aggregates from various soil types and also on methods of measuring soil aggregation.

(Project B-65)

Superphosphate More Efficient Than Rock Phosphate

Studies comparing the value of rock phosphate and superphosphate for crop production have shown superphosphate to be generally more efficient for wheat and corn.

Because of the variation in content and source of phosphorus in the plots used for these studies, they have been of considerable value in determining the reliability of new test methods. This applies to the new Maryland phosphate test as well as to the calibration of some other phosphate tests still in use.

(Project O-45-b)

Boron Deficiency Common in Alfalfa

A survey of 151 alfalfa fields in Maryland and a comparison of the results with those obtained on experimental plots afforded significant information regarding nutritional requirements of alfalfa. Fifty-six percent of the fields surveyed showed plant deficiency symptoms in boron during droughty periods in the summer of 1954.

Farmers can tell if alfalfa needs boron if plants show leaf-yellowing, combined with a shortening of terminal internodes. Many farmers confused these symptoms with leafhopper injury and so took no remedial measures.

Boron deficiency could have been prevented by an application of 15 to 30 pounds of borax per acre on questionable areas in the spring.

Boron content both in the plant tissue and in the soil sample varied as much as 300 percent during growing season. It was found that neither boron present in the soil nor in the plant tissue sample furnished a reliable index for predicting its future sufficiency during the growing season.

(Project O-51)

Soil Tests Improved

A continuous effort is being made to improve soil tests with the hope that they can provide a more accurate guide to fertilizing practices. A new method has been developed which closely correlates the phosphate content of soils with alfalfa growth, including even those soils which have been treated with rock phosphate. This is of particular significance because most quick tests for soil phosphate will register an excessive increase in phosphate from rock phosphate applications. Several Maryland farms have received treatments of rock phosphate and it is important to be able to more accurately measure it once it has been applied to the soil. Results obtained from the new method were compared with those from other methods which will make it possible for researchers in different parts of the country to evaluate its possibilities for use under their conditions.

Maryland soils have been analyzed for quantities of copper, zinc, manganese and molybdenum. In many cases the amounts of these elements are rather low and could result in plant deficiency symptoms in plants grown on such soils. Molybdenum, in particular, varies so widely in percentage content in soils that conditions ranging from animal toxicity to plant deficiency are found in Maryland. As the knowledge of these minor elements in such soils increases, their agricultural value will rise accordingly.

The importance of liming to good yields of alfalfa can hardly be overemphasized. A new test, better than the sieve test now in use, has been developed by this station. The new test shows the liming ability of ground limestone, regardless of its source, chemical composition or size of particle. This test will also apply to marl.

(Project O-52)

Continuous Corn Depletes Soil Organic Matter

Studies of the effects of various cropping systems on soil physical condition and organic matter content show that continuous corn has not main-

About 550 visitors viewed tobacco research work at the annual Tobacco Farmers' Field Day in 1955.

tained soil organic matter or soil aggregation.

This has occurred in spite of plowing under a rye-vetch green manure crop each year with the corn stover and fertilizing with 100 pounds per acre of nitrogen, 120 pounds of phosphorus (P_2O_5) and 120 pounds of potassium (K_2O). Continuous soybeans have been equally destructive of soil organic matter. Rotations including hay or grass crops have maintained or increased both soil aggregation and organic matter content. Bare fallow has been the most destructive of soil aggregation as well as soil organic matter content.

The effectiveness of a soil conditioner applied on half of each of the plots in this rotation continued to decline when judged by soil aggregation measurements. Corn yields in 1955 were eliminated by dry weather so they could not be used to further evaluate the soil conditioner.

(Project O-53, NE-11)

Soil Mineralology Studies Aided by New Equipment

Basic studies of minerals in sand and silt fractions of several Maryland soils have been completed. These results will provide much needed information on the mineral characteristics of soils and will give valuable guidance to soil management practices and fertilizer and cropping recommendations. Soils selected for these investigations were Chester loam, Elioak silt loam, Clymer fine sandy loam, Dekalb loam and Calvin silt loam.

Clay mineral determinations were made on Chester soils using X-ray diffraction methods in order to understand more completely the processes involved in the mineral breakdown and to explain the sharp differences in mineral concentration from one part of the profile to another. X-ray diffraction methods alone cannot fully identify certain clay minerals, especially those with those with expanding lattices such as Montmorillonite, Vermiculite and Illite. In order to characterize these minerals, thermobalance and differential thermal instruments were constructed. These were combined to operate simultaneously and to record their results on the same chart. The thermobalance was constructed with the help of the Bureau of Mines and the Agricultural Engineering department. It is the type developed by Dr. F. Mauer of the National Bureau of Standards. It is the third of its type constructed in the United States and the first one used for research in soils.

The thermobalance weighs a sample of clay suspended in a crucible inside a furnace in which the temperature rises from room temperature to 1200° C. Weight of the clay is recorded continuously over the entire range of temperatures. In the meantime the differential thermal apparatus records the difference in temperature between this clay sample and another inert sample which is always at the same temperature as that of the furnace. The combined records give information on the reactions which take place when a clay sample is heated. The additional information given by the thermobalance helps in interpreting the differential thermal curves obtained. It was possible to obtain information on the hydration of clay minerals in soils which otherwise could not be determined accurately. In fact, it was found that the same clay mineral can exist in widely different states of hydration from one horizon to another in the same soil profile.

(Project O-54)

Montgomery County Soil Survey Completed

In field work, cooperative studies with the Soil Conservation Service soil survey have resulted in the final correlation of soils in Montgomery county. This opens the way to the forthcoming publication on the detailed soil map and report of this county. In addition, conferences and field studies on the soils of the Coastal Plain were conducted in cooperation with soil scientists from other states, including Virginia, Delaware and New Jersey. This has resulted in a more unified concept among surveyors of the various soil series which overlap the boundaries of these states. Ultimately these states will be able to exchange information pertaining to these soils which overlap their borders.

(Project O-48)

Subsoiling Increases Corn Yields on Silt Loam Soil

Subsoiling a Beltsville silt loam soil gave 61 bushels of corn per acre, compared with 52 bushels without subsoiling. This increase was obtained by subsoiling in the fall before corn when the soil was drier than normal. Under this condition the subsoiling chisel loosened about 6 inches more soil on the average than was loosened by plowing alone. The chisel was run at a 22 inch depth on 42 inch spacings.

The corn growing season was marked by extremes of dry and wet weather. Changes in soil moisture during the season were followed with gypsum blocks buried in the soil at different depths. Subsoiled plots were drier than plots not subsoiled. The difference in moisture contents reflects better corn growth and deeper rooting on the subsoiled plots.

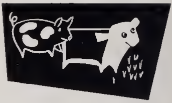
Subsoiling studies are being extended this year to include tests on Penn and Ashby shale soils as found in northern and western Maryland.

How Fast Will Soil Take Water?

Water intake by different soils is important in governing the design and use of irrigation equipment. To prevent erosion damage and runoff losses, water should be applied no faster than the soil can soak it up. The spread of irrigation on Maryland farms increases the necessity for intake rate information.

Accurate estimations of intake rates have been difficult to determine, but now a new procedure looks promising in tests made on cultivated soils. Small metal cylinders and multiple-point guages are used. Fifteen cylinders run at one time give a satisfactory estimate of the intake rate. This can be determined by one man in about an hour. However, several such estimates would be necessary to determine variations at different points in a field. Intake rates as determined by the cylinders are about 4 times as fast as the rate at which water should be applied to cultivated soils with sprinkler irrigation systems.

ANIMAL HUSBANDRY



Research work in animal husbandry is designed to assist livestock producers in producing meat animals more efficiently. Work is conducted in the fields of breeding, management, and nutrition. A sharp distinction is not made between fundamental and the so-called practical research, since it is intended that all discovered knowledge will eventually be of use to livestock producers and/or consumers.

In a report of this nature, only a resume of some of the more important work can be given. More detailed information is made available in scientific papers, bulletins, and popular articles released by the department. As soon as possible, findings are also presented to the public in other ways, such as at field days, short courses, news and radio releases, etc., in cooperation with the Extension Service whenever possible. In these ways, research results may be given producers and consumers as quickly as possible.

The conducting of the various research projects is in close cooperation with other departments of the University having a mutual interest, other state experiment stations, the U. S. D. A., local packing houses, and livestock farmers.

Record of Performance Research Continued

Rate of gain tests have been conducted for a second year in cooperation with the manager of a herd of Aberdeen-Angus cattle. Thirty-one bull calves, representing 4 sire-progeny-groups and averaging 248 days in age and 571 pounds in weight were weaned, weighed, scored and placed on a gain-test trial in October, 1955. These bull calves, after being on trial for a period of 153 days, averaged 939 pounds. The average gain was 369 pounds, and the average daily rate of gain was 2.41 pounds. Approximately one-sixth of the calves gained over 2.75 pounds per day, about one-sixth gained between 2.50 and 2.75 pounds per day, and about one-half gained between 2.25 and 2.50 pounds per day. The average number of pounds gained per sire-group ranged from 345 to 375 pounds.

Forty-four heifers were weighed and put on a gain-trial in October, 1955 and taken off trial in the spring of 1956. Nineteen additional bull calves were weighed, scored, and put on gain-trial in January, 1956. These calves have not completed their trial to date. Summarization of this data has not been initiated as yet.

Results and experiences gained from cooperation with managers of the above and other herds have been of use and great benefit in the formulation of proposed record of performance programs for beef cattle in the state of Maryland.

(Project C-14)

Test New System for Scoring Conformation

Part of a practical record of performance program involves scoring the conformation of the calves and other cattle in the herd. The scoring system used prior to this year included the following sections: general appearance, head and neck, fore quarters, body, hind quarters and over-all average. The scale of points ranged from 1 to 5, inclusive, wherein "1" indicated an animal which approximated an "ideal" animal, "3" indicated an "average" animal and "5" which indicated an animal of extremely poor beef type. The scores were recorded by using a whole number and one decimal system.

Experience indicated: (1) that too many individual parts of the animal were grouped under one heading, and (2) that no indication of the direction of variation from the so-called "ideal" animal was furnished the breeder.

A new scoring system has been devised but it is still in the experimental stages of development. Many (55) different items on the animal are scored on a scale which ranges from 50 to 130. Deficiencies in a characteristic (such as too shallow a body) are scored below "100"; "100" is set equal to that which is desired in the "ideal" animal; and scores over "100" are used when an animal appears excessive in a characteristic (for example, too long a head). Three groups of cattle have been scored using this new system. The data will be analyzed as soon as possible with the objective in mind of finding out whether or not this type of a scoring system would be practical and useful to breeders. Observations made to date indicate that the system has potential practical value.

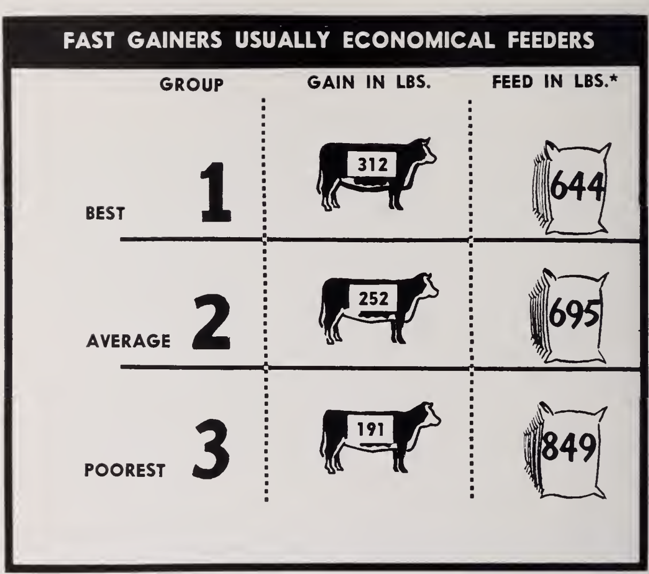
(Project C-14-b)

Calves Differ in Rate and Economy of Gain

All of the Aberdeen-Angus calves fed during the past 6 years were ranked in order within sex and weaning age group according to performance while on feed. Large variations were noted between the extremes in each category tabulated.

For example, the averages for the best 5 heifers (group 1), averaged 5 heifers (group 2), and poorest 5 heifers (group 3) which were weaned at 90 days of age were computed. The average weights of the 3 groups at 202 days of age were 353, 358 and 376 pounds, respectively. From the age of 202 days to 370 days, the best 5 heifers (group 1) averaged 312 pounds gain, the group 2 females gained 252 pounds and the poorest 5 heifers had an average gain of only 191 pounds.

For comparative purposes, the total digestible nutrients used by each group (TDN from both hay and grain) were converted into an equivalent number of pounds of corn. Group 1 used an average of 644 pounds of corn per 100 pounds of gain plus maintenance. Group 2 used 695 pounds of corn, and the five slowest gaining heifers (group 3) used an average of 849 pounds of corn per


FAST GAINERS USUALLY ECONOMICAL FEEDERS

100 pounds of gain plus maintenance. The more rapidly gaining group gained 121 more pounds of weight and used 200 fewer pounds of corn per 100 pounds of gain plus maintenance than the more slowly gaining heifers. Similar differences were found among the other weaning age and sex groups.

Studies have been initiated to determine, if possible, an estimate of the amount of the consumed total digestible nutrients which are used for growth, maintenance (using live weight or a function of live weight as the criteria for maintenance requirement), and other activities of beef calves.

(Project C-14-a)

Test Group Vs. Individual Feeding

The situation confronting a number of beef breeders wanting to evaluate economy of gains of beef cattle is that they cannot feed calves individually but they can feed them by groups. Because a reasonably large number of breeders believe that calves do not perform in a similar way under the two systems, this project was established for the purpose of comparing the rate of gain and the efficiency of gain of calves fed individually with those fed in groups.

Nineteen Aberdeen-Angus and 20 Hereford calves from the herds of the University of Maryland were allotted into essentially equal groups on a breed and sex basis. Half of the calves were fed individually and the other half were fed by breed and sex groups. The calves were weaned and placed on a gain-test trial on October 11, 1955, at which time they averaged 7.5 months in age and 493 pounds in weight. Detailed analysis of the data has not been initiated but it was of interest to note that the individually fed calves gained an average of 1.53 pounds per day and the group-fed calves gained an average of 1.71 pounds per day during the 224 days they were on trial.

In addition to securing weight and feed records during the trial, the calves were scored at the beginning and end of the gain-test trial by use of the new scoring system described under Project C-14-b. A series of measurements were secured on various parts of the calves at the beginning and end of the trial. These measurements will be studied in relation to the scores and rate and economy of gain data.

(Project C-14-d)

Heritability Estimates Calculated

Heritability estimates along with their standard errors of estimate were calculated for the number of pigs born alive, and number of pigs alive per litter at 21 days and at 56 days of age. Estimates were also calculated for the weight of pigs at the 3 ages. The estimates were calculated from data secured during the developmental phases of the Maryland No. 1 breed. The litters were divided, so that separate estimates were calculated from data secured from litters farrowed by dams 16 months or less in age at the time of farrowing and litters farrowed by dams over 16 months at the time of farrowing. Heritability estimates for both the weights of pigs and the

These individually-fed heifers did not gain as fast as group-fed calves on economy of gain tests.

numbers of pigs per litter at the various ages ranged from 0.0 to 0.7. The standard errors of estimates were in the neighborhood of 0.3 to 0.7.

(Project C-20)

Test New Worming Compounds

Sodium fluoride has, for a number of years, been the conventional treatment for the elimination of the large intestinal roundworm (Ascarid) of swine. However, it has little or no effect on the elimination of other types of internal parasites. Also, the toxicity and low palatibility of the compound have proven to be problems.

Recently, compounds of the cadmium and piperazine groups have received consideration since they are relatively palatable and non-toxic to the pig.

Information is needed on the comparative effectiveness of these new compounds in relation to sodium fluoride as ascaricides. Their effectiveness in the control of other internal parasites which may be present also needs to be determined. The comparative toxicity and palatability of the various compounds, as well as their effects on rate and efficiency of gain, are further considerations.

Investigations to study these problems have been initiated employing sodium fluoride, cadmium anthranilate, and piperazine CS_2. These compounds are being administered when pigs are 70 days old and again when they are 135 days of age. Results are being determined on the basis of (1) differential egg counts prior to and following treatment, (2) number of parasites expelled following treatment, and (3) number of parasites present when the hogs are slaughtered at market weights.

Preliminary results suggest that the new compounds are far more palatable than sodium fluoride. Piperazine CS_2 apears to result in a more prompt elimination of ascarids.

(Project C-24)

Graup-fed heifers on rate and ecanamy of grain test, shawing part of the facilities at Callege Park.

Effect of Protein Level on Swine Reproduction

Research conducted since the discovery of Vitamin B_{12} and antibiotics suggests that the crude protein levels of growing-fattening rations for swine may be lowered materially with no decrease in efficiency.

Since the feed costs for the gestation and lactation periods make up an important part of the total costs of swine production, re-evaluation of the protein requirements for these periods is of importance.

The effects of 10% crude protein as compared with 15% in the ration will be evaluated on the basis of their effects on number, weight, and vigor of pigs at birth and at weaning.

(Project C-23)

Metabolites Tested as Feed Additives for Sheep

Studies are being conducted to determine the value of certain rumen metabolites when such materials are added to the rations of ewes and lambs. It is possible that the feeding of such metabolites as acetate, propionate or lactate could beneficially affect feed utilization in the ruminant and that more efficient rations could be formulated when such materials are used.

During the past year a feeding trial has been conducted to test the effect of adding calcium lactate to the rations of fattening lambs. Two groups of lambs were fed in dry lot on rations composed of barley, corn, soybean oil meal and alfalfa hay. One group received calcium lactate at a level of approximately 10 percent of the concentrate allowance. The feeding of lactate did not appreciably affect the rate of gain of the lambs as the lactate-fed lambs gained 0.263 pounds per head per day as compared to 0.256 pounds per day for the controls. However in this trial, 100 pounds of calcium lactate replaced approximately 260 pounds of concentrates in terms of feed required for 100 pounds of gain.

(Project C-21)

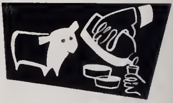
Radioactive Materials Being Used In Rumen Studies on Bloat

Studies on ruminant bloat are being conducted in cooperation with the dairy and bacteriology departments of the University and with the Animal and Poultry Husbandry Research Branch, A.R.S., U.S.D.A., One phase of this work involves the use of the cell suspension techniqe in a study of bacterial action in the rumen.

The cell suspension technique for studies on the metabolism of rumen bacteria is being modified and improved. Dissimulation tests using various metabolites are difficult to evaluate because the concentration of volatile acids in the cell suspension interferes with the determination of the acids produced from the metabolites added to the cell suspension. The use of C^{14} labeled metabolites was resorted to and the results indicate that this will greatly improve the accuracy of the method. There is also a question on the extent of inter-conversion which takes place among various volatile acids after they have been produced by incubation of a given metabolite in cell suspension.

(Project GC-45)

ANIMAL PATHOLOGY



The Department of Animal Pathology is staffed with veterinary and technical personnel. Some of the staff members devote full time to research, but most divide their efforts between animal pathology and the Live Stock Sanitary Service of the Maryland State Board of Agriculture. In the latter organization their work is mainly concerned with the diagnosis of diseases of animals and poultry. Many leads for research studies originate from this source.

Some research work of a fundamental nature is carried out but, in the main, efforts are pointed toward investigations which have a practical application. The project on rumen metabolism, with special reference to ketosis of dairy cows, is a combination of basic and applied research. During the year covered by this report no new results on the practical side were developed, so that no formal statement on this project is being made.

Search for Brucellosis Vaccine for Adult Cattle

The search for a vaccine to prevent the spread of brucellosis in adult cattle, without confusing the diagnostic picture with persistent agglutination titers, has long been one of the goals of research workers in the field.

A strain of virulent Brucella has been passed through more than 50 serial passages in embryonating eggs, with the result that the infectivity of the organism has been so modified that it is only mildly pathogenic for guinea pigs. It is hoped that, with additional passages through eggs, the organism will be further modified so that it may be used for the production of a vaccine which will induce satisfactory immunity and yet not produce long-lasting agglutination titers, which cause the animal to be classed as "infected." Preliminary trials in guinea pigs indicate that a vaccine produced from the egg-adapted strain may be satisfactory for use in cattle.

During the past year, embryonating eggs have been used to check more than 1,000 cattle blood sera for the presence of protective substances against brucella. These sera showed a wide range of variation in their protective qualities, depending on the age, vaccination status, environment, and individual characteristics of the cattle.

The serum of calfhood vaccinates of less than 2 years of age gave the greatest protection. This was reduced one-half by the time the animals were 4 years old and was further depleted with the succeeding years, although not entirely lost. Where calf vaccinates are quartered in infected herds, there is a tendency for less protection in the blood sera of young animals and more in the older group.

The serum of unvaccinated animals, which have been in accredited herds since birth, gave relatively little protection to infected embryonating eggs. Even when unvaccinated animals have come into some contact with Brucella in non-accredited herds, there appears to be little protective substance in negative sera. However, the sera of animals which have even low blood titers usually show considerable protection to infected embryonating eggs.

It is hoped that sufficient data will be accumulated during the coming year so that a quantitative test for evaluating the protective quality of individual cattle sera may be devised.

(Project D-46)

Survey Maryland Cattle for Anaplasmosis

In a committee report on anaplasmosis for the United States Live Stock Sanitary Association meeting in New Orleans, Louisiana, in November, 1955, it was pointed out that 17 states reported anaplasmosis as a major disease problem.

The complement-fixation test for this disease has been applied to cattle blood samples from 12 states. More than 90 percent reactors were found in some of the heavily infected herds.

A test was applied to 6,798 blood samples from 278 Maryland herds in 10 counties: 272 or approximately 4 percent, gave positive reactions. The number of herds tested in some counties is too small to give a true indication of the extent of infected or carrier animals. Plans are under way to include additional counties in the proposed herd survey for the coming year.

(Project D-50)

Newcastle Virus Can Live in Dead Embryos

It has been demonstrated that the virus of Newcastle disease will continue to multiply in embryonating chicken eggs after the embryo has died from the infection. The cells of embryos have been shown to be alive after 10 days storage in proper fluids at low temperatures. These findings have an influence on procedures for vaccine production. The virus of infectious bronchitis was shown to be non-pathogenic for rabbits and monkeys. The concentration of infectious bronchitis virus by chemical and physical procedures will be continued, because work to date has been inconclusive.

(Project D-52)

Search for Improved Methods of Treatment for Blackhead in Turkeys

Although several drugs have been found to be effective against blackhead of turkeys and chickens there is need for improved medicinal agents to combat this serious malady. Particularly desirable are drugs capable of suppressing the disease without interfering with the performance of treated birds. New drugs manufactured by several pharmaceutical companies are being tested for efficacy. An arranged series of chemicals has been synthesized by a commercial concern for the purpose of determining what radicals in the chemical structure of the drug are most effective. These new compounds are being assayed against blackhead artificially produced in the laboratory. As a result new medicinal agents are being found to be effective against the disease. The practical importance of such methods of treatment is as yet undetermined.

(*Project D-55*)

Test Antibiotics in Combatting Air-Sac Disease

During recent years air-sac disease has become one of the most serious diseases confronting the poultry industry. Of particular interest at present is the role of pleuropneumonia-like organisms (PPLO) in the causation of this ailment.

Recent investigations have shown that the group of antibiotics technically known as the tetracyclines, (tetracycline, oxytetracycline, chlor-tetracycline) are effective in preventing this disease when relatively high concentrations are used. While such therapeutic agents are costly at the present time, it is believed, with improved methods of production, in the future such medicinal agents may be employed economically.

Of particular importance to the problem of air-sac disease also is the identification of those bacterial organisms, often called secondary invaders, that sometimes work with viruses and pleuropneumonia-like organisms in producing disease. Identification of such complicating factors will prove a valuable guide in directing other suitable drugs to the solution of the problem.

Penicillin in Feed Promising for Erysipelas Control

Erysipelas of turkeys, a disease also common to swine and sheep, is a serious menace to breeding flocks in Maryland. Currently employed therapeutic agents require individual handling of birds for administration. Drugs that could be administered in feed would enhance beneficial effects of treatment.

Investigational work has shown that experimental erysipelas created in the laboratory can be prevented by penicillin, administered in feed. In naturally infected flocks, feed containing this antibiotic gives promise of controlling the disease in cases where infection was recently acquired. In cases of long standing infection, however, less satisfactory results were obtained.

(*Project D-56*)

BOTANY

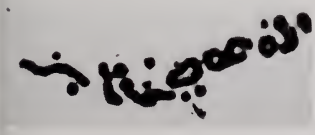
In the Department of Botany, research is in progress in three general areas: plant pathology, plant physiology, and plant genetics.

Projects are chosen with two main concepts always in mind: (1) the importance of acquiring new basic information; and (2) the application of new information and methods to the improvement of agriculture. Especially important is the solution of urgent problems that confront farmers and reduce their incomes.

X-Rays Increase Frequency of Plant Twins

Ordinarily each seed contains a single sexual embryo which develops into a seedling after germination. A few seeds have more than one embryo, resulting in the formation of multiple seedlings. Our research has shown that X-ray treatment of the pollen results in a great increase in the frequency of seeds with extra embryos. These spontaneous and X-ray induced multiple seedlings are useful in plant breeding and basic botanical studies.

The hereditary factors of corn are borne in 20 chromosomes. The male and female parents each contributes 10 chromosomes to the next generation. Last year, our experiments disclosed that losses of parts of the chromosomes following X-ray treatment of corn pollen resulted in the formation of extra embryos in the kernels.



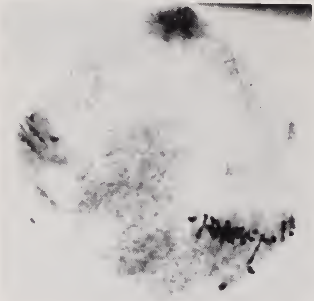
Giant pollen mother cell in an X-ray induced twin seedling of corn, showing atypical chromosome numbers. Normally 10 pairs of chromosomes are in the center of pollen mother cells.

A significant X-ray induced change was detected in a set of twins. During the early stages of pollen formation, the twenty chromosomes of corn are organized into ten pairs. In the set of X-ray induced twins, the pairing of like chromosomes from the male and female parents was blocked and abnormal chromosome numbers were detected in the pollen mother cells.

Two experimental lines of pepper, derived from twin seedlings, are being tested by vegetable specialists at the Horticulture Research farm. These lines appeared superior in fruit quality and were selected from 28 experimental lines grown in 1955.

(Project F-15-b)

Use X-Rays in Plant Breeding Studies



Portion of pollen tube of lily, showing X-ray induced ring chromosomes and fragments.

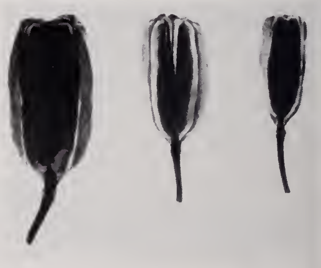
X-rays cause permanent alterations in chromosomes, the carriers of heredity. Some of the changes brought about by X-rays, such as the induction of hereditary factors for disease resistance, are of immediate utility to the plant breeder. Others are useful in advancing knowledge of the mechanics of inheritance.

Determining quantitative levels of treatment is the initial step in the use of X-rays in plant breeding studies. During the past year, we found that treatment with 4000 r units is not lethal to the pollen of *Lilium*. However, examination of the pollen tubes disclosed numerous ring and fragmented chromosomes. As a result, few seeds are formed following treatment of the pollen with 4000 r.

Different genera of plants vary greatly in sensitivity to X-rays. Seeds of *Lilium davidii* were exposed to X-ray dosages ranging from 5,000 to 350,000 r units. One percent of the seeds germinated following treatment with 250,000 r; none germinated after exposure to 300,000 r. The seedlings in the 5,000 r group formed their first true leaves more rapidly than those of the control, indicating a stimulatory effect of this treatment. Our results, in contrast to the limited experiments reported previously, show that the seeds of lily are not particularly sensitive to X-rays.

A study of cell structure in relation to quality in *Asparagus* has been initiated. Material from the field and from cold storage has been embedded in paraffin and cut into sections prior to the determination of cellular changes associated with fibre development.

(*Project F-16*)



Capsules of lily, after X-ray treatment of pollen. Left, normal, pollen not irradiated. Center, following pollen treatment with 2,000 r units. Right, after pollen treatment with 4,000 r units.

Survey Shows Nematodes Widespread in State

Investigations of soil and root samples from over 1000 fields have shown that nematodes constitute a major problem to Maryland agriculture. No field has been found free of plant-parasitic nematodes.

About 35 different types of plant parasites have been identified, many of them unknown in Maryland prior to this survey. The reduction in overall yield of all Maryland crops is estimated at 12 to 15 percent. Based on this figure, nematodes cause at least $12 million damage per year.

In order to devise control measures based on rotation, extensive host ranges are being prepared through greenhouse work. When resistant varieties are found, they can be used to reduce severity of nematode injury. In some cases, however, such wide host ranges exist that no rotation can be suggested at this time.

Other investigations are being conducted to test new chemicals for nematode control.

(Project J-96)

Development of Disease Resistance in Tobacco

Development of tobacco with resistance to black root rot, mosaic, wildfire, black shank, granville wilt, and anthracnose has continued.

For the past 3 seasons, one selection of the black shank-resistant tobacco has given good results. Resistance is high. Quality and weight are equal to the better Maryland varieties. Preliminary tests on nicotine, non-nicotine, and total alkaloid content indicates slightly higher total alkaloids in the resistant tobacco than Catterton and Robinson varieties.

Preliminary tests with Nicotianae species indicate that there is a source of immunity to aphids. This immunity has been carried to the F_1 progeny of a cross between the immune parent and Maryland Robinson variety.

(Project J-95)

Boron Affects Seed Production and Respiration

Boron increased the movement of radioactive sugar (sucrose) from leaves of *Impatiens* or stems of boron-deficient pea plants to the seeds located above and below the point of application of the sugar.

Addition of boron to the sugar did not improve the flow of sugar in plants adequately supplied with boron. Results indicate that the essentiality of boron for reproduction may in part be associated with the effect of this element on the movement of sugar to the developing ovules and, later, the seeds.

In other studies employing disks of carrot root tissue, it was found that low concentrations of boron (i.e., 5-10 ppm) had no effect on respiration but that a high concentration, for example 500 ppm, would depress it. Surprisingly, the inhibition was usually overcome in 3-5 hours. The nature of the inhibition and changes that resulted in the alleviation of the inhibition are as yet undetermined.

(Project K-8-c)

Test of Fungicides in Field and Laboratory

The effectiveness of several fungicides for control of foliage disease of tomatoes and cucurbits was studied in field plots. With seven of the eight treatments field tested, the yield of tomatoes significantly exceeded that from unsprayed plots. In experiments on spraying of cucurbits carried out cooperatively with the Department of Entomology, results indicate that with proper nozzle and boom design, the gallonage of spray per acre may be reduced without loss of disease control.

Laboratory work was continued to offer a better understanding of how fungicides work. One approach to this problem was through a study of compounds which offset or antagonize effectiveness of a fungicide in the hope that this may give a clue to its mode of action. Cysteine and glutathione, both compounds found in living cells, antagonize the action of certain dithiocarbamates under proper conditions in the laboratory. There is also evidence that some of the organic fungicides exert their effect through the mediation of heavy metals in the cells.

The ultimate aim in studies of this kind is to improve the effectiveness of the use of fungicides in plant disease control.

(*Project J-91*)

Soil Fumigation Controls Tobacco Diseases

One of the major problems of soil fumigation for nematode control in the past has been the method of application. Special equipment is required for the method most used at present. The need of extra prepara-

Most of the missing plants in the foreground died from a fusarium wilt—nematode complex. Plants at the upper right were grown on soil fumigated with ethylene dibromide; center, no treatment.

tion of the land for fumigation adds to the cost.

In an experiment run on strawberries in 1955, a new chemical in granular form was mixed with fertilizer and sidedressed on the living plant. The chemical was also applied in the liquid state at the same time the fertilizer was sidedressed. Both the dry granular and liquid forms gave excellent control of root knot nematode. No phytotoxic effects were noted.

The same chemical used in granular form has given good control of root knot nematodes in tobacco. However, the material has to be applied 3 or more weeks before planting tobacco to prevent injury.

In 3 separate field tests on tobacco over the past 3 years, soil fumigation (using both ethylene dibromide and D-D) has given good control of fusarium wilt in fields infested with root knot nematode and fusarium complex.

Five new chemicals have been tested in the greenhouse as soil drenches for tobacco black root rot control. All the plants in soil treated with the chemicals lived as compared to 100 percent mortality for plants in untreated soil.

(Project J-93)

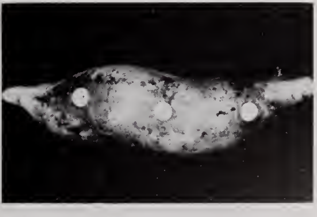
Test Fungicides for Scurf Control

Diseased roots and sprouts of the varieties Nemagold and Porto Rico were treated with several concentrations of the fungicides thiram, captan, ferbam, and Puratized to determine their effect on control of scurf.

Results at harvest time indicated that both root and sprout treatment are required for best control; that thiram and ferbam are satisfactory chemicals for such treatments and that Puratized at a dilution of 1:1000 gave control comparable to that of thiram and ferbam, caused no injury and resulted in better disease control than 1:5000 (the dosage previously recommended). Scurf was not severe when unrooted cuttings instead of rooted sprouts were used.

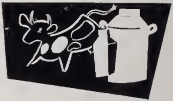
Another phase of this work was to determine if there were any sweet potato varieties or selections with appreciable resistance to scurf. Isolates of the pathogen were obtained from roots grown in California, Missouri, Oklahoma, Louisiana and Maryland. These isolates were used to inoculate a number of different varieties and selections. Inoculation studies revealed that none of the material tested was immune from infection but there was a difference in degree of susceptibility between certain varieties and selections.

(Project J-86)



Sweet potato, showing scurf symptoms, illustrating a laboratory inoculation technique using filter paper discs saturated with scurf fungus. This technique is used to determine relative susceptibility of varieties and selections to scurf.

DAIRY



Both the milk production and processing phases of the dairy industry are included in the research program of the Dairy Department.

Research in dairy manufacturing will contribute to continuing improvement in the quality of dairy products available. New tests have been studied and developed for determining the composition of milk and milk fat. Factors affecting flavor and texture in manufactured products have been studied.

Research has continued on the metabolism and utilization of feeds by the dairy cow. Forage utilization has received special attention. Important new information has been obtained concerning the synthesis of milk fat. The metabolic activity of rumen bacteria, particularly in regard to conditions associated with bloat and ketosis, has been intensively explored.

Colorimetric Fat Test Developed

A colorimetric test for fat in milk, which is based on the hydroxamic acid reaction, has been developed. In this test, the intensity of red color developed in the sample is proportional to the fat content of the milk. This new approach to testing milk for fat is being compared to the Babcock Test and the ether extraction method.

(Project G-35)

This cow, with rumen fistula, was used for studies on bovine digestion and metabolism of feeds.

Fat Test Receives Official Recognition

The method developed in the Dairy Department for determining the amount of butyric acid in fat has been adopted as first action by the Association of Official Agricultural Chemists. This test is used to detect substitute fats in dairy products. Milk fat is the only food fat containing butyric acid, therefore, when fat in a dairy product contains less than the normal amount of butyric acid, it is indicated that non-milk fat is present.

(Project G-35)

USDA Lactometer Test Shows Accuracy

Findings of investigations on the application of the U. S. Department of Agriculture lactometer method indicate that the results, as computed for solids-not-fat on mixed herd milk, averaged within approximately 0.1 percent of the results obtained by the gravimetric method. The range in variation for mixed herd milk was —0.16 to +0.28 percent. Wider variations were encountered on milk from individual cows. The deviation for milk from 60 individual cows, when computed for solids-not-fat, ranged from —0.30 to +0.27 percent, as compared with results obtained by the gravimetric method, with a mean deviation of 0.115 percent solids-not-fat. These results indicate that the U. S. Department of Agriculture lactometer method offers greater accuracy than previously proposed lactometer methods.

The accuracy of results obtained by the lactometer method was greater than those obtained by the formula method studied.

Observations indicate that factors possibly affecting the accuracy or the reliability of the lactometer method include: milk from individual cows, procedures used by different laboratories in performing the determination, accuracy of the lactometer instrument, and conditions of the milk sample.

(Project G-35)

Bulk Tanks Maintain Milk Quality, But Won't Improve It

Two farm bulk milk tanks, one of the ice bank or sweet water design, and the other a direct expansion unit, have been studied during the past year. The purpose of the study was to obtain information on the effectiveness of these basic design bulk tanks in maintaining milk at a high quality level on the farm.

Milk produced under various degrees of sanitation control was analyzed daily for speed of cooling, degree of cooling, maintenance of reduced temperature, bacterial population, acidity, and flavor. In all trials, both tanks used in this study were equally effective in maintaining milk at high quality, providing the original milk was of high quality. Milk of high quality was stored in these tanks for 10 days before the quality of the milk was affected. However, when milk of original low quality was utilized in the study, the effectiveness of the bulk tanks was reduced tremendously.

Bulk tanks, regardless of basic design, appear to maintain satisfactory quality in milk, but cannot be expected to improve it.

(Project G-44)

Chemical Changes In Milk Fat Related To Flavor

Work has continued on the substances responsible for oxidized or stale flavors in milk products. Reaction of oxidized milk fat with dimedon, a reagent specific for aldehydes, eliminated oxidized odor from the fat, indicating that the major flavor compounds were aldehydes. A method has been developed for regenerating carbonyl compounds from 2,-4-dinitrophenylhydrazones so that the organoleptic properties of isolated carbonyl compounds can be studied. This regeneration method will be very useful in studies of compounds responsible for oxidized flavor in dairy products, because the individual carbonyl compounds can be isolated and purified in the form of their hydrazones and then regenerated for odor and flavor assay.

(Project G-34)

Continue Study of Browning of Heated Milk

Research on development of the brown pigmentation in heated milk has been continued during the past year. The scope of this study is to isolate, purify and identify the substances responsible for the color formation.

Much has been learned about this milk defect. Indications are that the pigment is formed from a heat-catalyzed inter-reaction of the milk protein and milk sugar. The resultant color is apparently due to the formation of a series of similar compounds. The mixture of brown pigmented material has been isolated and concentrated.

The fractionation of the concentrated mixture of pigmented substances has been the major consideration. Many methods of separation have been attempted. However, because of the nature of these substances with their extreme solubility in water and slight solubility in all water-free solvents, the fractionation attempts have met with only limited success. Recent studies involving some of the newer concepts and techniques of fractionation are very encouraging.

Experiments have shown the presence of carbonyl compounds and primary and secondary aliphatic amines in the concentrated brown pigment concentrate.

(Project G-40)

High Temperature Processing Improves Ice Cream Quality

Observations made of ice cream mix pasteurized by the Roswell process at 240 to 260°F. indicate that the characteristics of the mix and the finished ice cream were favorably affected by this method of processing.

Results showed that high temperature processing produced some stabilization effects in mix and in the finished ice cream when fresh and during storage. The keeping quality of mixes, processed at temperatures ranging from 200 to 260°F., varied directly in relation to the processing temperature. Mixes processed at 240° and 260° showed low bacterial counts after six weeks storage at 40°F.

(Project G-42)

New Discoveries About Formation of Milk Fat

In studies at the University of Maryland it has been shown, by the use of radioactive carbon and the perfused udder (mechanical cow), that beta-hydroxybutyric acid in the blood, which is produced primarily from butyric acid formed in the rumen, is a principal precursor of the short chain fatty acids of milk fat.

The short chain fatty acids constitute approximately 25 percent of the milk fat; the longer chain fatty acids account for the remainder. Radioactive acetate had earlier been shown, also, to be converted to the short chain fatty acids of milk fat. The Dairy Department studies indicate that the short chain fatty acids of milk fat are derived almost entirely from acetic acid and beta-hydroxybutyric acid, which are taken up by the udder from the blood. The remainder of the milk fat is derived from blood fat, specifically, the neutral fat.

These studies indicate that maximum milk fat production is dependent upon a maximum synthesis of the short chain fatty acids within the udder from acetate and beta-hydroxybutyrate and a maximum uptake of the longer chain fatty acids from the blood. A depression in either the synthesis of the short chain fatty acids, or the uptake from the blood of the long chain fatty acids will tend to depress milk fat production. A depression in both may be expected to produce the most marked reduction in the percent of fat in the milk.

The availability of the longer chain fatty acids (as neutral fat in the blood) is dependent upon the mobilization of fat from the body depots and from the intake of food fat The synthesis of the short chain fatty acids is dependent upon the availability of acetate and/or beta-hydroxybutyric acid in the blood and a source of unknown energy, probably glucose. Under normal conditions, when there is a depression in the synthesis of the short chain fatty acids, such as occurs during fasting, the mobilization of the long chain fatty acids from the body depots tends to compensate for this decrease and thus maintains a normal percent of fat in the milk. However, when the synthesis of the short chain fatty acids is decreased by the feeding of cod liver oil or the feeding of low roughage-high bread rations, fat mobilization does not increase as it does in the case of fasting, and in fact, may be decreased with the result that there is a marked decrease in the percent fat in the milk and in total fat production.

(Project G-43)

Develop Diet for Study of Milk Fat Formation

Nineteen cows were used in a study of the relationship of low roughage-high concentrate rations to the percent fat in the milk. It was established that it is extremely difficult to depress the fat content in the milk by the use of such rations when normal feedstuffs are fed. When the total amount of alfalfa hay was limited to six pounds per day and the concentrate consisted of bread and molasses, however, a reduction in fat of 40 to 70 percent was obtained.

Rumen bacteria obtained from these animals, when incubated with glucose, were observed to produce very little acetic acid, but a large amount of propionic and butyric acids. This is in contrast with rumen bacteria from cows on normal rations from which the production of acetic acid from glucose is greater than that of the other volatile acids.

The marked decrease in percent fat in the milk, which resulted from the feeding of high bread-low roughage rations, thus appears to be due to a marked change in the fermentation of carbohydrates by rumen bacteria, probably because of an alteration in the starch which occurs in the baking of the bread. A basic diet has thus been developed which is being used in a search for the major factors which control the formation of milk and milk fat and thus, the percent of fat in milk.

(Project G-38)

Starch Production and Metabolism by Rumen Bacteria

Additional studies have been made on the ability of rumen bacteria to produce and store starch from carbohydrates. This is a mechanism which enables them to store a reserve supply of energy, and thus may be considered very important in the nutrition of the animal.

The addition of moderate amounts of urea did not alter the formation of bacterial starch, and did not hasten its utilization once produced. A trace mineral mixture decreased the amount of starch formation. In low concentrations, such as might normally be found in the rumen, cobalt did not affect starch synthesis or utilization. The presence of cobalt in high concentrations retarded starch synthesis and utilization. Rumen bacteria appeared to produce starch equally as well from 5-carbon as from 6-carbon sugars and the same starch or polysaccharide appeared to be produced.

Storage of starch by rumen bacteria enables them to store a readily available energy source, which should allow these organisms to attack cellulose and synthesize protein, even when the soluble carbohydrate intake is low for short periods.

(Project G-39)

Bloat Thought to be Caused by Froth in Rumen

Continued studies on bloat in cattle has resulted in the concept that bloat is caused by the production of a stable froth in the rumen and reticulum, and that bloat develops because this stable froth mechanically blocks eructation, or belching.

During the past year it has been established that the formation of stable froth in the rumen is increased by the addition of glucose, valeric acid in certain concentrations, and isolated alfalfa saponin. Additional evidence has also been obtained showing that the slimy nature of the froth in the rumen of bloating animals is probably due to a marked increase in the number of bacteria which are surrounded by a thick gelatin-like capsule.

A simplified diet was developed for further basic studies on the relationship of various feed components to the above factors which have been shown to be associated with bloat.

(Project G C 45)

Sodium Lactate Effective for Ketosis Treatment

During the past year we have observed that soluble sodium lactate produces a much greater rise in the blood sugar level of normal cows than does calcium lactate.

Both substances, when given by

mouth, resulted in a marked increase in rumen propionic acid. However, the oral administration of 3 pounds of calcium lactate did not increase blood lactic acid, whereas a similar amount of sodium lactate resulted in a three-fold increase in blood lactic acid.

It was concluded, therefore, that soluble lactates are extremely effective in increasing blood sugar and that this increase is due primarily to a marked absorption of the lactic acid into the blood stream and subsequent conversion into blood sugar.

Experiments in the field have verified these findings on normal cows. In the field experiments, it was found that cows with ketosis recovered much more rapidly following the administration of sodium lactate than from the administration of calcium lactate.

Thus, studies on the absorption and metabolism of lactic acid have resulted in the development of a still more effective method for the treatment of ketosis. It is to be expected that soluble lactates will also be effective preventatives.

(Projects G-37 and G-39)

Test Value of Apple Pomace and All-Roughage Rations

Recent changes in the apple by-product industry have provided a considerable increase in the amount of apple pomace offered as a feed in Maryland. In order to provide more reliable information on the feeding value of this product, growth and digestion studies involving 24 dairy heifers and 4 steers were instigated.

Heifers fed 4 pounds of apple pomace per day, with alfalfa offered free choice, grew at the rate of 1.13 pounds per day compared to a growth rate of 1.26 pounds per day for heifers fed alfalfa and 4 pounds of corn meal per day. Calculations indicate that

The digestiblity of experimental forages is determined with the aid of this type of apparatus.

the apple pomace was worth about 85 percent as much as corn meal.

Two groups of 8 growing heifers have been fed on all-roughage rations throughout the winter feeding period in conjunction with other experiments. In one instance, the daily ration consisted of 12.5 pounds of mixed wheat-vetch grass silage, and U. S. No. 2 timothy hay, free choice. The other ration was U. S. No. 2 leafy alfalfa, fed free choice. Average daily gains were 0.98 and 1.06 pounds, respectively. At mid-pasture season, these heifers were equal in weight and condition to similar animals fed usual amounts of grain.

These results indicate that reasonably good quality forages alone provide a satisfactory ration for wintering dairy heifers.

(Project G-39)

Hay + Grain in Dry Period Enables Fresh Cows to Reach Full Feed Quicker

One group of ten cows was maintained on an all-alfalfa hay ration during the dry period, whereas a second group was maintained on 8 pounds of concentrate per day, plus hay ad libitum. Both groups received hay, plus the concentrate ration, following calving. In most cases it was possible to attain a full feeding level more quickly with cows which had received concentrates during the dry period.

Following calving, no great differences were observed in the proportions of the various rumen volatile acids between the group which received concentrates only following calving and the group which received a concentrate ration both before and after calving. After calving no marked differences were noted between the two groups in blood glucose, ketones or general health. The cows which received grain during the dry period diet ate more grain during the first days after calving.

(Project G-39)

Test Value of Early-Cut Alfalfa for Milk Cows

An intensive study was conducted during the past year to evaluate the effect of crop management practices on the usefulness of alfalfa for dairy cattle.

Lactation and digestibility studies involving 12 lactating cows were undertaken on first cutting alfalfa harvested at one-tenth bud, full bud, and one-half bloom. The anti-pyrine indicator technique was used to estimate changes in body composition of these cows. Digestion studies with four steers were conducted on these hays and on the second, third and fourth cuttings from the same areas harvested at one-half bloom.

Preliminary results with the cows indicate, that for milk production, first cutting alfalfa harvested at full bud and one-half bloom was worth 94 percent and 87 percent as much as that harvested at one-tenth bud. Results of the digestion studies will be reported as chemical analyses are completed.

(Project G-47)

ENTOMOLOGY

The economical application of the best insecticide with proper equipment at the correct dosage at the right time is of critical importance to most farmers. The Department of Entomology conducts investigations so that detailed recommendations can be made with the aim of providing practical solutions to insect control problems. Research work is concerned not only with practical measures which will enable farmers to increase production and improve quality but also with studies of a fundamental nature which will contribute toward the solution of problems in the future.

Heptachlor Used to Control Chestnut Weevils

The emphasis on this project at the present time has been to find an economical method to control chestnut weevils and thus make chestnut growing a profitable business. Heptachlor used as sprays or dusts, applied to the ground cover, has successfully controlled adult weevils in two preliminary tests. Large scale tests are now in progress.

Studies on the biology of other nut pests, such as the pecan weevil, acorn weevils, filbert weevils and insect pests of walnut, are being continued.

(Project H-60)

Vinegar Gnat Eggs Reduced on Tomatoes in Transit

Pyrethrum spray, applied to baskets of tomatoes while they were being loaded in the field, greatly reduced subsequent oviposition in transit and during storage before processing. Seventeen hours after treatment, trap tomatoes in treated baskets contained only 12 Drosophila eggs while the same number of trap tomatoes in untreated baskets contained more than 3500 eggs in the same period of time. Such sprays stop the movement of large numbers of adult gnats from the field to the canning plant. Insecticidal sprays and spray baits, though giving encouraging results, do not yet appear practical in the field. They are expensive and not too efficient. Continued effort will be made to develop practical field control methods since this promises to be the only effective solution to the problem.

(Project H-29-k)

DDT Residues on Snap Beans Below Tolerance

Fall snap beans sprayed with 4 pints of 25 percent DDT emulsion in 25 gallons of water per acre with Slosser boom equipment contained a maximum of 3.94 p.p.m. of DDT 24 hours after treatment. When sprayed three times, in the two-leaf and the blossom stages and when the beans were half size, the beans contained a maximum of 1.98 p.p.m. of DDT 7 days after the last treatment. The tolerance for DDT is 7 p.p.m. These results indicate that fall snap beans can be safely sprayed after the first picking with DDT for earworm control. Earworm control is usually necessary at this time in most of Maryland to prevent direct loss of the crop, and to prevent contamination in processed beans.

(Project H-29-1)

Malathion Effective for Control of Cabbage Looper

In experiments at College Park, sprays of 2 pints of malathion emulsion applied every 7 days gave complete control of insects on broccoli. This insecticide was applied in 25 gallons of water per acre when plants were small; when plants reached the heading stage the amount of water was increased to 50 gallons per acre. Toxaphene emulsion at 2 pints per acre gave better insect control on broccoli than DDT but not as good as malathion. No residue determinations were made of malathion-treated broccoli, since the results of work in 1954 showed that practically all malathion is removed from broccoli by a short wash in water. Residue analysis of DDT and toxaphene-treated broccoli immediately after treatment showed an average of 7.4 p.p.m. of DDT and 5.7 p.p.m. of toxaphene from a single application. On broccoli harvested 7 days after treatment, amounts of both toxaphene and DDT were below 1 p.p.m. Results indicate that higher residues persist on the florets for a longer period of time than on the heads.

Residues on broccoli treated weekly after each harvest showed a maximum average of 3.79 p.p.m. of toxaphene and 2.48 p.p.m. of DDT. Both insecticides were applied in the emulsion form at 1 quart per acre. Since malathion residues do not persist long, a rigid schedule of applications may not be possible under commercial conditions because of adverse weather conditions. It is advisable to include toxaphene in every third malathion spray to provide prolonged protection if timing of treatments is interrupted.

(Project H-46-d)

Malathion Effective for Asparagus Beetle Control

Malathion applied at 1 1/2 pints per acre with broadcast equipment as recommended for pea aphid has been found to be highly effective against the asparagus beetle in the spring. More than one application is necessary since migration of beetles from hibernation extends over a comparatively long period of time. Maximum residues on samples taken immediately after treatment show 4 p.p.m. of malathion (the tolerance is 8 p.p.m.). There was less than 1 p.p.m. of malathion 24 hours after treatment. Processed asparagus, both canned and frozen, showed no residue. Significant off-flavors could not be detected.

(Project Q-H-58-0)

Test Value of Systemic Insecticides

With the advent of new residual insecticides, research on control of pests of ornamentals has been conducted at an accelerated pace. Work has been conducted especially to determine the value of systemic insecticides, the best time for application, and the best methods of application for the control of a number of pests.

Malathion has proven to be quite useful in the control of pests of ornamentals especially since its toxicity to human beings is low. Consequently tests have been conducted and effective dilutions, together with effective timing of applications for the control of boxwood, psyllid, holly leaf miner, boxwood leaf miner and the Eunonymous scale have been worked out.

(Project H-35-a, b, c)

Study Biology of Alfalfa Weevil

During the past year we have made some advances in our knowledge of the biology of the alfalfa weevil

The majority of weevil eggs are laid in the spring and fall, with the peak in the spring. Fall eggs pass the winter and hatch early in the spring. The resulting larvae complete their development somewhat ahead of larvae hatched from spring eggs. Larval and egg development is considerably retarded in cool spring weather.

It is believed that newly emerged adults do not copulate and lay eggs until the following fall.

Adults are believed to spend the summer and winter in the field. During these seasons they are very difficult to locate. There is evidence that clumps of grass or alfalfa are the preferred hiding places. It is known that the weevils can live a long time without water. Last summer a number of individuals lived 2 months at about 80° F. without water. Other individuals were given water at 2 week intervals. The weevils came over to the water droplet and were observed to drink. It is believed that the weevils could easily spend the entire summer in a grass clump and receive sufficient water from the dew to survive.

(Project H-62)

Work on Orchid Pest Control

The most important work in progress with pests of orchids is an endeavor to transmit color break of catleyas by Boisduval's scale. It will require one or more years to determine whether this particular scale may be involved in the transmission of the virus that causes color break. Virus plants have been infected with Boisduval's scale. The next step will be to transfer the scale from the known infected plants to plants known to be uninfected. While the life cycle is usually much shorter than a year it takes about one year to get a new infestation thoroughly established.

Tests on the control of mealybug *P. citri,* Rossi on small Phalaenopsis plants indicate that a combination of malathion and pyrenone is satisfactory if applied when the osmunda is moist.

(Project H-50-a)

Study Mosquitoes in Farm Ponds

A survey of 55 farm ponds in 5 Maryland counties indicated that under present conditions these ponds produce few mosquitoes.

Studies are in progress which will show the relation of mosquitoes in the transmission of filarial worms to raccoons, skunks, opossums, squirrels, and rabbits.

(Project H-63)

Severe damage by tobacco hornworm came when bad weather made control difficult. Star Photo.

Tractor Sprayers Used for Hornworm Control

Tobacco hornworm damage during 1955 presented no unusual features until the first two weeks of August when rainy and stormy weather made it difficult or impossible for aircraft to operate. Lack of insecticide treatments caused some serious losses and, in a few instances, a nearly total loss of the crop on some farms.

Gear pumps and plunger pumps attached to tractors which deliver 15 to 25 gallons per acre are becoming more and more popular with growers for control of first brood hornworms. This type of equipment makes it possible to apply combinations of insecticides when it is advisable to do so.

Observations on grower-operated hornworm moth traps demonstrated that they are not a dependable method of control. Some of the fields with traps in them require insecticide applications to control the worms.

(Project H-40-a)

Corn Borers Increase On Lower Shore

Corn borer infestation increased sharply during 1955. While there was a general increase throughout the state, the increase was greatest in Caroline, Dorchester and Wicomico counties on the Eastern Shore. Infestation on the lower Eastern Shore has been rather high for several years.

Coincident with population increase of the borer, there has been a gradual decrease in the parasitism of the overwintering brood. This is particularly true for Lydella which has dwindled from 40-60% to 10% or less. The reasons for the decrease in effectiveness of parasites is not apparent at present.

(Project H-43)

Hand Operated Sprayers Vary in Effectiveness

Studies on the effectiveness of sprays applied by hand-operated compressed air sprayers show considerable variation in effectiveness. The amounts of spray applied vary between individuals. One operator applied spray at the rate of 25 to 30 gallons per acre while another applied more than 50 gallons per acre. The effectiveness of malathion in such sprays was found to vary with the actual amount of insecticide applied. At the dilution recommended on the malathion label, insufficient insecticide was applied when 50 gallons of spray was applied per acre. When insecticides were applied as dusts, operators applied far greater amounts of insecticide than applied in sprays. Hand applications were far in excess of amounts recommended for commercial application.

(Project H-65)

Ryania Effectively Controls Codling Moth

The amendment to the Miller Bill regarding excessive residues on apples projected a challenge to experiment stations for the development of new insecticides that could be safely used in the spray program. In 1955 a project was started at the Hancock Field Station to develop a spray program that would meet the requirements of the Food and Drug Administration, give control of codling moth and be non-phytotoxic.

Data obtained during the past 2 years indicate that the problem has been partially solved. Ryania, a botanical material, which is exempt from residue tolerance, has proven as effective against codling moth as the standard DDT program when used alone, or in combination with several other insecticides. Ryania alone gave 97 percent clean fruit as compared with 96 percent from the standard DDT program. Ryania at one-half the recommended strength used in combination with one-half the recommended strength of lead arsenate, Malathion, DDT and Parathion, all gave control equal to that obtained with DDT. Some of these new and safer insecticides will be incorporated in the 1957 spray program.

(Project H-48)

Fail to Find Vectors of Peach Yellows

A study into the distribution of the plum leaf hopper, *Macropsis trimaculata* Fitch, which is a vector of peach yellows and little peach, has been carried on at the Hancock Field Station for the past 2 years. Leaf hoppers were collected in commercial orchards and dooryard plantings of plum and peaches in an area bound by Martin's Mountain in the west and Thurmont in the east.

During these 2 years a total of 284 leaf hoppers have been collected in this region. None of these were plum leaf hoppers, as shown by comparison with an identified specimen of the plum leaf hopper.

(Project H-61)

HOME ECONOMICS

Test Effect of Dietary Deficiencies

If humans eat a deficient or unbalanced diet long enough, or if the deficiency is severe enough, it will result in a pathological condition requiring medical attention.

We have long recognized this. But what happens if deficiency occurs to a mild degree?

Metabolic experiments have been conducted the past 4 years in an effort to find the effect of dietary shortcomings on internal functions. The number of subjects is limited by the restrictions experimental conditions place on personal activities of participants. They can consume no food or drink, other than that provided at the laboratory. Excreta must be collected at the laboratory. Another limiting factor is the extreme care that must be given preparation of the controlled diet. It must be kept palatable to avoid dietary monotony, chemically analysed, and carefully weighed at mealtime.

The metabolic experiment with college women this year showed a variation in the utilization of protein according to both the quantity of protein intake and the level of calories of the diet. As the supplements of protein of beef and haddock were increased, the amount of nitrogen excreted increased somewhat but not in proportion to the increase in intake. After the total protein intake of the subjects reached 35 grams there was a marked increase in excretion of nitrogen.

Only the carefully analysed and weighed diet was eaten in metabolic experiments.

As protein supplements were increased, there was also a need for an increase in calories to maintain body weight. Body weight has been used as an indicator of the extent to which: (1) body tissue was used up in addition to the diet (loss of weight); or (2) diet is stored in the body (gain in weight). The increased need of calories was from 800 to 1500 calories when the protein of the diet was increased gradually from 12 grams to 40 grams. This emphasizes the need for more calories to maintain body weight when protein intake is low.

In fact, there is a need for the study of factors causing slight changes in weight from day to day in metabolic studies. After weight has been maintained for 4-5 days, if a subject sleeps a few hours less than usual there seems to be a loss of weight. Even when weight maintenance occurs we are not certain that tissue weight is constant. A small amount of tissue may have been replaced with water.

This work does indicate that more calories are needed to maintain weight when protein consumption is increased.

(Project BJ-9 Y1)

HORTICULTURE

The efforts of Horticultural research are aimed at more efficient production of better fruits, vegetables, flowers, and ornamental plants, with the common goal of higher returns for the producer and better products for the consumer. The research program thus involves studies ranging from plant breeding to the canning and freezing of fruits and vegetables, carried on in the laboratories and greenhouses at the University, on the experimental farms, and on the farms and orchards of cooperating growers throughout the state.

Some of the recent results of the research program are briefly presented in the following pages. More detailed information is available in scientific journal papers, station bulletins, and popular articles released by the Experiment Station. The research laboratories, greenhouses and farms of the department are open to those interested in horticultural research, and growers and processors are cordially invited and urged to attend the various programs, field days, and meetings where the most recent research findings are presented directly to the producer.

Chloro IPC Unsuitable for Thinning Peaches

Extensive experiments in 1955 on Sunhigh, Elberta, and Halehaven peach trees with isopropyl N-(3-chlorophenyl) carbamate (chloro IPC) indicated that this compound is too severe for further consideration in peach spray thinning experiments. Foliage injury, heavy overthinning in some cases, and malformation of fruits at harvest time resulted in several of the experiments, despite favorable results with this compound in the two previous years. Further work is being carried on to screen additional new compounds for suitability for spray thinning of peach trees well after the blossoming period.

In apple experiments, it was found that 11-year-old Golden Delicious trees required a high concentration (30 ppm) of napthaleneacetic acid for adequate thinning. This age has been heretofore regarded as too young for chemical thinning sprays. Small experiments on other varieties during the past 6 years have shown that apple varieties other than Golden Delicious should not be spray thinned until the trees are 12 to 14 years of age. In studying chemical thinning of Golden Delicious trees carrying varying amounts of "off" year bloom following spray thinning the year before, it was found that trees carrying 40 percent or more bloom must be sprayed to produce adequate fruit size at harvest time and to induce heavy blossoming the following year. It is assumed that this minimum figure will vary considerably for different varieties.

(Project L-74-b)

Irrigation Increases Peach Yield 40%

A study of soil moisture and growth rate of Sunhigh peaches as affected by irrigation in 1955 showed an increase in size and yield of irrigated fruits of approximately 40 percent. Moisture in the upper 2 feet of soil was very low in the non-irrigated block for about 3 weeks prior to harvest; however, fruit growth did not cease. Only one good irrigation, which wet the soil thoroughly, applied to the irrigated block almost 3 weeks before harvest, resulted in a rapid increase in fruit growth to give 40 percent size increase.

The soil moisture readings taken at 6 inch intervals down to 2 feet, showed that many summer showers of less than 1 inch failed to wet the soil to the 12 inch depth. Thus it is possible that moisture at lower depths may become increasingly lower while the upper depths are adequately supplied. It was noted that moisture from light rains was dissipated very rapidly, which emphasized the importance of applying enough water when irrigating to penetrate the main root zone of the trees.

One irrigation 3 weeks before harvest increased the size and yields of Sunhigh peaches by 40%.

(Project L-74)

Time of Discing for Maximum Benefit

It is standard practice in many peach orchards to sow a cover crop in early fall to help prevent erosion during the winter months and to make rapid growth in early spring for discing down to maintain soil tilth and organic matter. Such a cover competes with the trees for moisture, hence it is usually disced before it has a very high dry matter content.

In 1955, soil moisture was found to be higher following two differently timed discings when compared with soil moisture where the cover was still growing. A third discing was done after the cover crop had matured. Measurements shortly before harvest of a large number of fruits in the three plots revealed no differences in fruit size. Adequate rain occurred in

Light disking of the peach orchard winter cover crop stops moisture competition by the cover, provides an erosion-preventing mulch and slowly available organic material for the orchard soil.

mid-June which brought soil moisture in all plots up to field capacity. In such a year it appears that the cover could be left longer without lessening fruit size; however, in a year when soil moisture is not replenished, fruit size may be affected. If moisture can be maintained through irrigation, then a delay in cutting in the cover seems to be justifiable.

(Project L-74)

Seek Ways to Boost Tomato Production

Results of a 3-year study just completed, may boost dropping production of tomato products in the Middle Atlantic States. This work was spurred by declining production of tomato products in the Middle Atlantic area, where tomatoes usually constitute the most important processing crop. Under contract to the USDA, university horticulturists studied the effects of tomato variety, soil fertilization, foliar nutrient spray, and time of planting in the field, as well as effects of different heat processes, additives, screen openings, and atmospheres, during the processing of the tomatoes. Quality measurements were made on raw and canned tomatoes, and tomato juice.

From the field standpoint, it was found that little could be done (with the possible exception of irrigation) to combat unfavorable climatic conditions which occur frequently during the month of August. Highest promise of a field control measure lies in the development of superior, high-yielding, disease resistant varieties that have good flavor and color.

The processing studies revealed that it may be possible to produce substantially better colored tomato products through careful control of acidity. Tomatoes in this area usually have a pH of about 4.5. This necessitates sterilization temperatures which cause a substantial loss in color quality. It was also shown that consumers readily accept tomato products having a pH as low as 4.1. Thus, where the pH of tomato products could be maintained at a pH of 4.1, sterilization temperatures could be reduced to minimize color loss.

(Project Q-58-i)

Tomato Varieties Differ in Response to N_2

On the basis of 1 year's work it has been shown that all varieties of tomatoes do not respond alike to nitrogen applications. This has been determined in test plots, some of which received high nitrogen just after planting, others received moderate levels at all times of application, and still others received a low level of nitrogen early with higher increments of nitrogen as the season progressed.

Because the findings cannot be considered conclusive on the basis of 1 season, it is too early to predict how each of the varieties should be fertilized, but it is hoped that it may be possible to properly catalog each of the common varieties within the next few years. In the first season, there were very pronounced effects upon the yields of U. S. No. 1 grade fruit, and upon the yield of fruit in the first 4 harvests. Timing of nitrogen applications had no apparent effect upon the total yield from 10 harvests among the 17 varieties and strains used, however.

(Project Q-79-e)

Nitrogen Sidedressing Increases Yield of Irrigated Beans

What changes in fertilizer practices should be made with a given vegetable crop when irrigation is to be used? Tests were carried out for the past 2 years in order to determine the fertilizer needs of snap beans with and without irrigation.

Results show the importance of adequate fertility levels if the greatest benefit is to be obtained from irrigation. The amount of nutrients needed by an acre of irrigated snap beans seems to be somewhat higher than those not irrigated. Sidedressing with 25 pounds of nitrogen per acre when plants were 3 to 4 weeks old in addition to a normal application of complete fertilizer with the planter, has resulted in an increase in yield of about 50 bushels of beans per acre. Sidedressing with complete fertilizer to supply an equivalent amount of nitrogen gave equally good results. Excellent response was also obtained when soluble nitrogen or complete fertilizer was applied through the irrigation system while irrigating.

(*Project BOQR-83*)

Test Cool-Season Vegetables for Western Md.

Cooperative experimental tests with cool-season vegetable crops are being conducted in the mountain area of the state near Oakland in Garrett county. Included are: variety studies with cabbage, cauliflower, lettuce and spinach; fertilizer and date of planting studies with cauliflower.

In one season's results the cauliflower varieties Snowball Y, Snowball Imperial, and Snowcap, and Great Lakes 118 and 407, and A-36 varieties of lettuce were outstanding. Marion Market and Bonanza were the highest yielding early cabbage varieties and both were free of cracked heads. Green Acre, Resistant Detroit, and Medium Copenhagen were slightly earlier varieties of cabbage with excellent yields.

(*Project Q-74*)

Fertilize Plants Thru Water Supply

Applying small amounts of soluble fertilizer in the water supplied greenhouse plants holds promise of being a labor saving practice, as well as a method of producing better growth. With this system, plants are always supplied with a soluble fertilizer so that less emphasis on fertility of the greenhouse soil is required. Any soil with good physical condition may be used satisfactorily under this system.

In this study a soluble 25-10-10 fertilizer has been used at rates varying from 1/2 to 4 ounces per 100 gallons of water. The frequency of application varies with the season, kind of plant and its size. During the summer 1 or 2 applications daily are required while during the winter months applications may be less frequent as the daily light and temperature conditions decrease the rate of drying out of the soil.

Poinsettia, hydrangea, azalea, gardenia, cyclamen and annual flowers have been under test during the past several years.

Poinsettia stock plants and those being grown for flowering did best when fertilized at the 4 ounces per 100 gallon rate, although it appears that they could have been given higher rates for still better growth. Hydrangea varieties showed a varietal response with the variety Hamburg growing vigorously during the summer at the high rate of application, while Strafford showed injury. The variety Hamburg actually produced plants too large for good commercial forcing. Azaleas produced the largest plants at the 2 ounces per 100 gallon rate, although plants receiving the 1 ounce per 100 gallon rate during the summer and 4 ounces per 100 gallon during the forcing period produced the best flowering. The gardenias reacted in a similar manner. The response of annuals was variable.

Further studies are being continued on these and other plants to determine the proper rates of application and variations that may be involved due to changes of the season or stage of growth.

(Projects 1-79-h; 1-79-i; 1-74-a)

Soil Tests Not Correlated With Leaf Analysis

Correlations between the amounts of nutrients in the soil as determined by "quick" soil tests and the nutrient level of apple and peach trees as determined by leaf analysis were found to be very low. This was made evident in analyses of a series of soil and leaf samples taken from 37 apple orchards and 17 peach orchards throughout the state in 1955.

The results showed quite clearly that there was no consistent relationship between the amounts of magnesium, phosphorus, and potash in the soil as shown by the soil tests and the respective amounts in the leaf. Similarly there was no apparent relationship between the levels of the soil nutrients and the vigor of the tree. In a number of instances the soil analysis showed "very low" magnesium or potash levels when the accompanying leaf analysis was very high in these elements. The converse situation was also found.

The soil samples in these tests were from the 0 to 6 inch soil layer. It is possible that subsoil samples would show different results. However, from the present work and from experiences of other workers, it would appear that "quick" soil tests are of little use in estimation of tree nutrition requirements. The value of soil testing for pH and lime requirement determinations in the orchard, is of course, unquestioned.

(Project Q-79-b)

Nutrient Needs of Cauliflower Studied

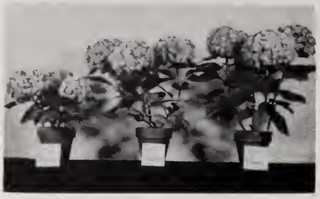
Mineral nutrient requirements of cauliflower have been studied for the past 2 years. Low, medium and high levels of nitrogen, potassium, calcium, and magnesium were provided in sand culture in the greenhouse. Effects on vegetative growth, head production, and mineral content of leaves were determined.

Results emphasize the importance of a high level of nitrogen during early development of the plants as well as during the period of head formation. High levels of potassium also resulted in better growth of young plants and tended to increase vegetative growth and head size of mature plants.

Chemical analyses of leaves indicate that the following mineral nutrient contents were associated with good growth and head production: nitrogen (N) 4.2 to 5.2, potassium (K) 5.2 to 5.8, calcium (Ca) 3.9 to 4.2. magnesium (Mg) 0.35 to 0.75, and phosphorus (P) 0.80 to 0.95 percent of dry weight.

(Project Q-79-h)

Temperature Controls Height of Potted Plants



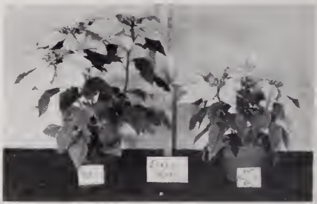
Hydrongeas produce the largest flowers when grown slowly in greenhouse at relatively cool temperatures. Left, 10 weeks at 66° F. Center 12 weeks at 60°. Right, 16 weeks, at 54°.

It is often difficult to grow large flowers on flowering potted plants in the greenhouse without producing plants that are too tall.

Several years' experiments in the University greenhouses have shown that temperature has an important effect in the size of the different plant parts. A temperature of 66 degrees F. produced poinsettias with large bracts (the showy floral leaves) but also with very long stems as compared with plants grown at 54 degrees F. Hydrangeas forced into bloom in the greenhouse produced tall stems and large flowers at 54 degrees F. and short stems and small flowers at 66 degrees F.

It has now been shown that with poinsettia the more desirable short plants with large bracts can be produced by using a relatively cool temperature (50-55 degrees F.) early in the season during the time of stem growth and then by continuing growth of the plants at a relatively warm temperature (66 degrees F.) during the time that the bracts are growing rapidly.

(Project I-74-a)



Poinsettias produce compact plants with large bracts if grown at cool temperatures early in the season, followed by warmer temperatures.

Chemicals Improve Sweet Potato Sprouting

Studies with sweet potatoes have shown that the number of sprouts produced per bushel of seed may be increased by 50 to 100 percent by treating the potatoes with certain "growth-modifying" chemicals before bedding.

These chemicals may be added to the fungicidal dips normally used for disease control. However, wide differences were found in the response of different varieties to the chemicals. A given chemical or a given concentration may be beneficial with one variety and of no benefit, or even harmful, to another.

One of the most promising treatments yet found is the use of Dalapon at a concentration of 1,000 parts per million as a dip in combination with the fungicide. This chemical has proved to be highly stimulative over a wide range in concentration without injury to the variety Sunnyside. Its effect on other varieties has not been determined.

(Project Q-77)

Cuttings root faster than usual under intermittent misting, with a higher percentage of rooting.

Mist Propagation Simplifies Rooting of Cuttings

The propagation of plants under intermittant mist is a technique that is simple and successful for both the commercial producer and amateur gardener. Under a mist system, foliage is kept moist to prevent cuttings from drying out. Since it is not necessary to reduce the light intensity when propagating under mist, cuttings may be maintained under optimum light for photosynthesis during the rooting period. Furthermore, the constant presence of water on the foliage will keep it cooler, which is important during the summer months especially.

Many kinds of plants may be rooted under such a system. It has been found that cuttings root as fast or faster under this system than under usual methods, with a higher percentage of rooting. Root-inducing substances add their stimulating effect if they are used along with the mist system. Softwood cuttings of azaleas, poinsettias, and carnations root readily in full sun with this technique, as do many foliage plants commonly used as house plants. This method of propagation is adapted for easily rooted woody plants (such as forsythia and privet) as well as for more difficult to root kinds (rhododendron, hemlock and Amur maple).

A mist system is essentially a line of misting nozzles installed over the propagating bed. The nozzles may be of any type that will give a fine mist over the width of the bed, spaced so they give an even distribution over the cuttings. The pattern of the mist distribution and the water pressure will determine the number of nozzles needed. To make such a system automatic, a solenoid valve and timing device are installed and a time clock to start and stop the misting. The timing device is set to operate the mist from 5 to 10 seconds of each minute. Normally, it is necessary to have the system operate only during the daylight hours.

(Project I-74-a, b)

Develop Quick Rank Test for Multiple Comparisons

A quick rank test for significance of differences in multiple comparisons has been developed in connection with regional studies on methods of detecting flavor changes resulting from the application of pesticides. Results obtained from taste panels must first be analyzed statistically before it may be determined whether a particular pesticide causes a real difference in flavor.

The proposed method, although generally applicable, is particularly suitable where actual values are not necessarily meaningful, but where it may be convenient, or even desirable to rank a series of samples in order of preference. The method is based on the polynomial distribution with number of treatments equated to the terms the polynomial, and the number of replications to the power.

The procedure for using the method is as follows:

Each treatment is ranked in comparison to the other treatments as first, second, etc. This process is repeated for each replication. Rank totals are then obtained for each treatment, and these totals referred to a table which will indicate the probability of the treatment differences being real, or only due to chance.

(Project QH-58)

Quick Measure for Toughness of Raw Green Asparagus

A new test cell and blade has been developed for the Maryland shear-press which will measure the fiber content or toughness of raw green asparagus for freezing.

Samples of from 12 to 20 spears are placed in the test cell so that a single blade will completely sever each spear at a point 6" from the tip. As the blade passes through the sample the resistance of the spears to the cutting surface of the blade is registered on a G. E. strain gauge. The tougher the asparagus the higher the reading on the gauge.

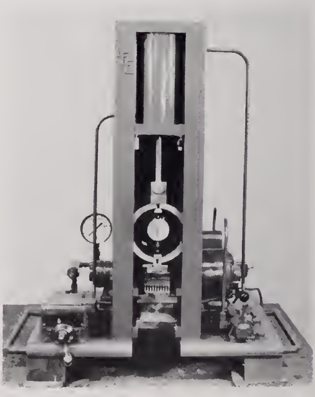
(Project Q-58-f)

New Model Shear-Press Developed

From the time that the shear-press was first released from this station in 1950, it has been applied to the measurement of textural quality of lima beans, green beans, baked beans, peas, sweet corn, asparagus, apples, beets, celery, potatoes, chicken, and turkey. The need for maximum precision has been emphasized when the instrument was put to commercial use, particularly when the price paid to the grower, or processor of food products is determined by shear-press values.

A new model has been developed, which features a proving ring dynamometer. When properly calibrated, it assures utmost precision of results. Modifications in the test cell obviate the possibility of error from the source; a quick return of the spindle reduces time required for a test.

(Project Q-58-f)



New model shear-press equipped with a proving ring dynamometer gives maximum precision for checking textural characteristics of vegetables.

Devise Electronic Defect Counter

The factors of defects constitutes an important part of many grades and standards of quality of processed fruits and vegetables. Although in most cases these defects are easily identified, they are so minute, and numerous that methods for evaluating the defect factor are frequently very tedious and time consuming. Also, the food grader is frequently faced with the problem of how big or how dark some speck or blemish must be before it counts as a defect.

To solve this problem, at least for defects exhibiting color differences from the normal material, a device was constructed which is capable of automatically tallying every speck which is 2mm square and which reflects not more than 50 percent of the light reflected by the normal material. It is planned to test the instrument first on apple sauce and tomato catsup, and later on additional products.

(Project Q-58-f)

Reduce Sweet Corn Processing Losses

Canned or frozen whole-kernel sweet corn undergoes nutrient, flavor and weight losses. This is caused by extensive contact of the freshly-cut kernels with water and brines in processing operations and subsequent storage.

In an effort to reduce such losses, commercially processed sweet corn was dipped in test solutions after cutting from the cob. This was done to seal the freshly-cut edge during the canning and freezing operations. These treatments have been compared with samples blanched on the cob.

Results show that 2 dips (low methoxyl pectin, and a combination of calcium chloride and low methoxyl pectin) show promise in retaining solids and flavor of frozen corn. Concentration of the material was 2 percent.

Blanching on the cob increased the drained weight of both frozen and canned corn and also resulted in a higher sugar content in the frozen corn. Under the conditions of the test there was no impairment of flavor caused by blanching on the cob.

(Project Q-58-k)

New Sweet Potato Varieties Don't Discolor

It has been shown in earlier work that the discoloration or darkening which occurs after sweet potatoes are peeled for canning is the result of the action of an oxidase enzyme present in the sweet potato. It was found that the darkening could be largely prevented by preheating the roots prior to the peeling process.

Since it was evident in this earlier work that different varieties of sweet potatoes showed varying degrees of activity of the enzyme, a check was made of all varieties, selections and seedlings grown in the experimental plots this past year to determine their relative oxidase activity and darkening potential. It was found that several of the newer varieties such as Goldrush, Sunnyside and Kandee and certain of the numbered selections showed negative, or near negative oxidase activity, and did not darken upon peeling.

(Project Q-74)

POULTRY

The role of research in poultry husbandry is to help the poultry industry in the over-all goal of producing the greatest amount of poultry meat or eggs at the lowest cost.

Since feed is the most important single cost involved, much of the work revolves around producing the greatest amount of edible product on the smallest amount of feed. Favorable feed conversion ratios in turn are produced by birds that grow very rapidly, or lay large numbers of eggs when fed rations of high nutritional worth.

Much of the research work in poultry, then, is directed toward improving strains of birds and improving the rations they are fed. Before progress in these fields can be made, however, it is often necessary to secure fundamental information concerning the physiological and biochemical processes that take place in the living bird. While all research, on the surface, may not appear to have a practical aspect, the guiding principle is to secure fundamental information which can later be applied in a practical way.

Breed Productive New Strain of Medium White Turkeys

Eight years of breeding has produced a strain of white turkeys which is medium to large in size and has excellent reproductive capacity.

During the months of March, April, and May of the current year, egg production was in excess of 70 percent, and hatchability of all eggs set was in excess of 75 percent.

At market time, these birds weigh approximately 20 pounds for the toms and 12 pounds for the hens.

The birds have been bred continuously in confinement starting with a cross of Broad-Breasted Bronze toms and Beltsville White hens. They appear to be somewhat better adapted to these rearing conditions than most commercial strains. It is felt that these birds have good commercial potentialities when used as a pure strain, and the practicability of using the females of the strain in a cross with large Broad-Breasted Bronze or Broad-Breasted White toms is being investigated.

(Project M-34-e)

Development of a Flightless Strain of Chickens

Several years ago, a New Hampshire male was observed in the University flock which had normal feathering in all respects except that the 22 large flight feathers were missing. This male was mated to New Hampshire hens, and a strain of New Hampshires was developed from this original stock which had a high incidence of the flightless character. The flightless New Hampshires were in turn crossed with White Leghorn birds, and a strain of white flightless birds has been developed. The flightless birds are not as large as the regular broiler-type New Hampshires, but approach that size. Egg production has been very satisfactory for a strain of this size. Each year a total of 12 individual breeding pens has been employed on this project, and a total of approximately 1,000 progeny raised. This year, of the chicks produced, approximately 80 percent had white plumage and 80 percent were flightless. Selection is being continued to purify the strain for these two characters, as well as to improve the growth rate. The commercial adaptability of the birds has not been determined.

(Project M-33-i)

Genetic Control of Serum Cholesterol Level

A study of genetic differences in the serum cholesterol level in chickens is now under way, but it will be some time before such a study will yield results of practical importance. Cholesterol is of interest in poultry since it is known to be involved in synthesis of certain of the hormones which are the regulators of growth, egg production, and other characteristics. It is quite conceivable that differences in the amount of cholesterol in the blood stream may be reflected in similar differences in the rate of production of certain of these hormones.

Determination of the serum cholesterol level of young chicks has shown the existence of differences between families, which is evidence of a genetic difference. There is also a slight difference between sexes. There is apparently no correlation between serum cholesterol level and body weight at eleven weeks in the stock used. During the ensuing year, the correlation between cholesterol level and other economic traits will receive consideration.

(Project M-33-e)

Explore Use of Hormone to Induce Molt of Hens

One of the known female sex hormones is progesterone. The exact function of progesterone in the hens has not been fully established, but investigations have shown that when approximately 20 mg. of progesterone are injected into the mature hen, it causes her to begin the regeneration of feathers with a period of molt ensuing.

Progesterone is a comparatively inexpensive hormone, and it is felt that the injection of this material could be a useful commercial technique to cause breeder hens to molt early in the fall so that they would be ready for winter hatching-egg production.

In the past year, groups of birds were injected during April, June. and July, and their egg production and molt recorded. It was found that as the season progressed, the amount of molt resulting from progesterone administration increased, and that birds induced to molt in April or May came back into production after a short molt and then continued their annual molt during the fall season. These results indicated that the practical use of progesterone in producing molt is thus limited to the late summer or fall season.

As a matter of interest, pigeons were also treated with progesterone, but they failed to molt as did hens. *(Project M-32-l)*

Study Storage of Chicken Semen

The continued lack of success in storing semen of the chicken after it has been collected prompted further research on this problem, but on an aspect that has been little studied. There is apparently something about the hen's oviduct which is particularly favorable for sperm, since they can be stored therein for ten days or more without loss of fertilizing ability. In an attempt to provide similar conditions in a diluent for semen, certain of the proteins known to be produced by the oviduct were tested alone and in combinations for the ability to prolong sperm life when stored outside the body. The proteins used did not show any beneficial effect in preserving the motility or fertilizing ability of spermatozoa. Therefore, until further research is done, it is still recommended that chicken semen used in artificial insemination be used immediately after collection.

(Project M-33-j)

3 Pound Broilers Raised at 10½ Cent Feed Cost

Research has shown that optimum results may be obtained in the production of broiler chickens when there is a proper balance between the productive energy and the crude protein content of broiler feeds. It has been determined that approximately 42 to 43 calories of productive energy are needed in broiler starter feeds for each 1 percent crude protein compared with approximately 49 to 50 calories needed in finishing feeds.

This pen of broilers raised at the Salisbury station reached 3.05 lbs. average weight in 8 weeks, with only 1.96 lbs. feed per pound of body weight. Feed cost per pound of broiler was about 10½¢.

Studies with poults indicate that approximately 30 calories of productive energy per pound of feed are needed for each percent crude protein, provided the protein quality is good.

Application of these concepts has permitted the use of very high levels of fat in poultry feeds which only a few years ago were considered to be detrimental to growth. The application of the calorie-protein concept has recently permitted the production of 3.06-pound broilers (mixed sexes) in eight weeks with only 1.96 pounds of feed required per pound of weight.

The rations which were used in this test, which involved approximately 8,000 broiler chickens, were very economical. Approximate feed costs amounted to only 10.5 cents per pound.

Wide-spread application of the principles of the calorie-protein ratio have put chicken meat into a highly competitive position in comparison with other meats.

(Project M-35-l)

Hormone-like Feeding Product Tested in Broiler Feeds

Several tests have been conducted during the past year involving the use of a new feeding product entitled "dienestrol diacetate." This material, when added to the finishing rations of turkey fryers, increased rate of growth and slightly improved the feed conversion ratio. In a field study involving approximately 800 broilers, administration of this new drug throughout the experiment was found to improve the rate of growth, but at the same time the birds which were fed the drug seemed to consume slightly more feed than their respective controls. However, the hormone-like drug exerted a beneficial effect on the dressing qualities of the birds by producing a highly desirable yellow pigmented skin, and increased deposits of fat under the skin, making the birds more succulent when prepared for the table.

(Project M-35-l)

Test Shows Little Value in Pelleting Broiler Feed

In a recent study at the Salisbury substation, the value of pelleted versus nonpelleted feeds was studied in a test involving approximately 8,000 broiler chickens. Feeds containing 0, 2 and 4 percent fat were fed in both pelleted and nonpelleted form.

The addition of fat to the all-mash feeds seemed to improve the growth rate. A similar observation was made with the pelleted feeds containing the three levels of fat. Similarly, the amount of feed required to produce a pound of weight was also reduced by the addition of fat to the different experimental feeds. The average weights of the broilers was improved by the addition of fat to the pelleted feeds.

Although data are quite limited, they nevertheless suggest that pelleting of the rations containing fat may have only slightly improved the growth rate. Neither the addition of fat nor pelleting of the ration appeared to exert any consistent influence on mortality, feather score, or litter score.

(Project M-35-l)

Use Poultry By-Products Under Practical Conditions

In a practical field test, 4,000 broilers were reared on feeds which contained three new by-products of the poultry processing industry; namely, 2 1/2 percent feather meal, 1 percent poultry blood meal, and 8 percent poultry fat. Adequate precautions were taken to assure similar amino acid balance between the rations containing the poultry products and the other rations.

From the results which were obtained after 9 weeks, it was evident that no differences were encountered in growth rate, feed conversion, feather score, litter score, or mortality. This shows that poultry by-products may be used in practical poultry feeds if care is taken in the formulation of feeds.

(Project M-35-h)

Methionine-Energy Relationships Determined

Methionine is one of the amino acids most likely to be limiting in practical broiler feeds. Until recently, little was known relative to the amount of methionine that should be added to poultry feeds. Last year, it was determined that a relationship existed between the energy content of a ration and the methionine requirement of the broiler chicken.

In battery trials, it was found that the methionine requirement (expressed as a percent of total protein) is increased as the proportion of productive energy to crude protein in the ration is increased.

As a result of a large broiler field trial involving feeds containing calorie-protein ratios ranging from 40 to 44, it was found that the methionine requirement was satisfactorily met when 2.31 grams of methionine were supplied for each 1000 calories of productive energy in the ration. In the finishing feeds, which contained calorie-protein ratios ranging from 47.5 to 53.6, it was determined that only 1.94 grams of methionine were necessary for each 1000 calories of productive energy. In terms of percent of protein, it was found that the methionine requirement is met when the protein contains approximately 2.15 percent methionine.

(Project M-35-i)

Arsenicals Improve Turkey Growth

Arsanilic acid, has been used to promote the growth and improve the feed conversion of broiler chickens for 3 years. Recently, an experiment was conducted involving 8 pens of approximately 115 straight-run Maryland Medium White turkeys from hatching to 20 weeks of age to determine the effect on growth rate and feed conversion of adding 90 grams of arsanilic acid per ton of feed. At 8 weeks, the four pens which received the arsanilic acid supplement averaged .11 pound more than their respective controls and consumed approximately .01 pound less feed per pound of gain. At the end of 20 weeks, the turkeys which received the arsanilic acid weighed .14 pound more than their controls and consumed an average of .24 pound less feed per pound of gain. The administration of the drug seemed to exert no appreciable effect on mortality.

(Project M-47)

Unidentified Factors Needed in Purified Chick-Poult Rations

The existence of further unidentified factors necessary for rapid growth have been demonstrated by many investigators. These unidentified factors are found in such supplements as brewers' yeast, whey, distillation products, fish products, alfalfa meal and others.

Current studies of concentration of the unidentified factor activity of some of these materials have been very encouraging. Poults from three different sources have been used, with consistent improvement in growth rate when combinations of unidentified factor supplements (including condensed fish solubles, distillers' dried solubles, dried distillers' yeast, dried whole whey, and molasses distillers' solubles) were added to highly purified-type experimental diets. In three successive trials, water extracts of a mixture of the supplements listed have been active in promoting growth of poults and protecting poults against a hock disorder which has been observed in poults fed the basal ration containing no such supplements. At the present time, the response which has been obtained cannot be accounted for by the addition to the basal ration of any known nutrients such as vitamins, amino acids, or minerals.

This hock disorder shows up in poults fed diets free of unidentified nutritional factor sources.

Breeder hen diets have been formulated to be both deficient and complete in unidentified factor supplements. Growth and subsequent performance of the progeny of hens that had been fed either the complete or the deficient rations have been similar. However, responses of from 10 to 20 percent have been consistently obtained with the chicks from both sources upon the addition of a mixture of dried brewers' yeast, dried whey, and condensed fish solubles, each at the 5 percent level.

(Project M-35-g)

Vitamin B_{12} Study

Vitamin B_{12} contains 5,6 dimethylbenzimidazole. Two compounds, 1,2 dichloro-4,5-diaminobenzene and 2 ethyl-5-methylbenzimidazole, were found to be toxic for the development of chick embryos. Vitamin B_{12} partially reversed this toxicity, indicating that other metabolites, possibly riboflavin, guanine and adenine, may also be involved. The search for a specific antimetabolite of the biologically important vitamin B_{12} might lead to a compound which could be used in treating diseases caused by B_{12}-requiring organisms, or in treating tumors. Antimetabolites are used extensively to study function of the vitamins.

(Project M-49)

RURAL SOCIOLOGY

For many years, Maryland's population and social organization had changed but little. Before World War II, more people were born in this state than could remain here, so Maryland helped to populate other areas. More recently, this trend was reversed. Now, more people move into the state than move out. The number of people moving into Maryland is proportionately higher than any other northeastern state.

At the same time, farm population declined.

These and other social actions are changing the character of Maryland's population.

The mixed blessings of change bring new problems for the individuals, groups, and agencies involved.

The aim of rural sociological research is to gain a better understanding of these changes and the problems they bring, in the hope of finding solutions to these problems.

Farmers Have More Dependents

Analysis of census data show that the farm population differs markedly from non-farm people in two respects: 1) farm families support more dependents; and 2) there is a greater proportion of older folks in rural areas.

Farm families support more children and aged persons than non-farm families. Family members of these age groups frequently constitute a financial burden on the active breadwinners.

On the other hand, many of the aged farmers remain active. One of the implications of this trend is the greater use of machinery to ease physical labor. In farm areas the aged tend to retain their own homes and household authority. Over 70 percent of men over 75 are heads of households. Unemployment and absence from the labor force become a problem for the aged.

(Projects S-3 and S-3-1)

Suggest Changes In 1960 Census Classifications

Frequently, in census data, a residence classification includes population groups which do not have common social characteristics. We have endeavored to develop simple changes for the 1960 Census which will make analyses of rural-urban fringe populations more realistic.

For example, a recommendation which demands practical field study is that place of work and place of residence data be obtained in 1960. In a fringe area this information would be useful to designate different kinds of populations by their commuting characteristics.

(Project S-3)

TV and Radio Effective for Teaching Homemakers

The first general evaluation of urban Home Economics Extension in the United States has been accomplished in Baltimore City. Summary data have been made available which indicate that homemakers club members differ in many ways from a random sample of white women.

Members have higher occupational and educational levels and are more likely to belong to organizations.

Non-member women prefer to receive homemaking information through mass media.

To make acceptance of new or improve practices more likely among non-members, mass media information must be prepared and presented with this particular group in mind. Information must be consciously directed toward people whose level of education differs markedly from extension cooperators (members). Because teacher and learner do not have a face-to-face relationship, subject matter must be organized so that it can be understood without questions or discussion.

Members and non-members are interested in different kinds of subject matter. While most non-members wanted information on cooking, most club members wanted information on home arts. About a fifth of each sample wanted more information on clothing but again their experiences and characteristics were manifest in that they wanted information on different kinds of clothing problems.

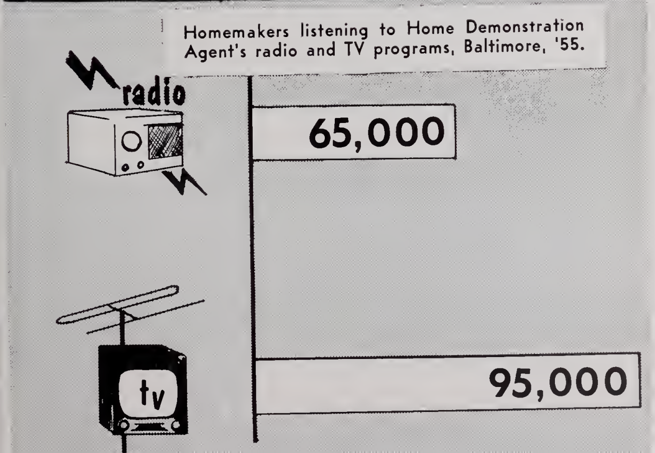
Of the non-members, over one-third watched television programs by the home demonstration agent. One-fifth heard one radio program, and five percent another.

Of the listeners and viewers questioned, one third said they used ideas gained from these programs.

Audiences of this size and number who accepted practices indicate the economy and scope of this kind of extension teaching.

(Project S-4)

REACHING THE UNREACHED



Homemakers listening to Home Demonstration Agent's radio and TV programs, Baltimore, '55.

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A525—A Procedure for Sampling and Grading Raw Green Asparagus. Amihud Kramer, A. Kornetsky, N. Elehwany, G. L. Steinmetz and E. L. Morin. Food Tech. 10(5):212-214. May, 1956.

Department of Poultry Husbandry

242—Studies on Levels of Fat, Choline, Salt and Protein on the Ration and a Quaternary Ammonium Compound in the Drinking Water of Broiler Chickens. G. F. Combs, G. L. Romoser and J. L. Nicholson. (Mimeographed Circular) 17 pp. July, 1955.

257—Effect of Calorie-Protein Ratio and Methionine Level in Rations Fed to Crossbred Broilers. G. F. Combs, G. L. Romoser and J. L. Nicholson. (Mimeographed Circular) 13 pp. March, 1956.

A515—Local Effects on the Feather Papilla of Thyroxine and of Progesterone. Mary Juhn and P. C. Harris. 1955 Proc. Soc. for Exp. Biol. and Med. 90:202-204.

A537—How the Period of Exposure to Different Stress Stimuli Affects the Endocrine and Lymphatic Gland Weights of Young Chickens. H. W. Garren and C. S. Shaffner. Poultry Sci. 35(2):266-272. March, 1956.

Department of Sociology

240—The Population of Maryland: Growth, Composition and Distribution for 1900-1950 and 1940-1950 and Characteristics in 1950. W. C. Rohrer and F. D. Laws. (Mimeographed Circular) 66 pp. July, 1955.

Projects

(These are projects and not publications available to the public)

Department of Agricultural Economics and Marketing

Project No.

A-18-ai—Business Analysis of Southern Maryland Tobacco Farms. G. A. Stevens, A. B. Hamilton and P. E. Nystrom.

A-18-aj—Farm Labor Requirements. A. B. Hamilton and R. A. Murray.

A-19-o—Conservation and Economy in Rural School Bus Transportation. W. P. Walker.

A-19-p—Factors Affecting the Cost of Certain Kinds of Insurance to Farmers. W. P. Walker, P. R. Poffenberger, S. Ishee and A. N. Cruit.

A-19-r—Impact of Maryland Highway Improvement Program on Agriculture. W. P. Walker, J. H. Dagher and A. N. Cruit.

A-19-s—Effects of Maryland Tax System and Fiscal Policy on Farmers Tax Liability. W. P. Walker and J. H. Dagher.

A-19-t—Capitol Requirements in Agriculture. P. R. Poffenberger.

A-26-ae—Lowering Marketing Costs: Increasing Efficiency in the Operation of Milk Receiving and Processing Facilities. G. M. Beal, F. R. Manson and A. W. McKay.

A-26-ah—Marketing Maryland Forest Products. S. C. Shull and B. R. Robertson.

A-26-ai—Marketing Wheat, Corn and Soybeans in Maryland. D. J. Burns, S. C. Shull and E. B. Miller.

A-26-aj—Marketing Maryland Livestock. H. D. Smith, H. H. Harp and G. M. Beal.

A-26-ak—A Study of Retail Practices and Egg Quality in Baltimore. H. D. Smith, R. C. Hawes and J. B. Horne.

A-26-al—Analysis of the Development of Farmer Cooperatives. P. R. Poffenberger and R. J. Beiter.

A-26-am—Consumer Purchases and Acceptance of Poultry Products Under Various Merchandising Practices. H. D. Smith and W. G. Langston.

A-26-an—Relation of Various Livestock Marketing Methods to Producer Returns. H. D. Smith and H. H. Harp.

A-26-ao—Quality and Volume Effects Upon Economies of Plant Operation in the Canning of Tomatoes, Corn and Peas in Maryland. G. M. Beal, D. J. Burns, P. R. Poffenberger, E. Gogel and L. C. O'Day.

A-26-ap—Supplies and Utilization of Milk for Non-Fluid Uses in the Washington, D. C., Milkshed. G. M. Beal, A. D. Jeffrey and P. R. Poffenberger.

A-26-aq—Marketing Maryland Snap Beans. S. C. Shull and L. C. O'Day.

A-26-as—An Economic Study of Retail and Wholesale Flower Marketing. D. J. Burns, E. G. Taylor and P. R. Poffenberger.

A-26-at—A Study of Egg Marketing in Maryland. H. D. Smith and W. G. Langston.

A-32-f—Farm Tenancy and Leasing Arrangements in Maryland. L. B. Bohanan.

A-32-h—Effect of Drainage Upon Crop Yields, Farming Practices and Land Utilization. L. B. Bohanan.

A-32-j—Problems Associated with Farm Irrigation in Maryland. L. B. Bohanan.

A-33—Financial Arrangements in the Broiler Industry. H. D. Smith and J. B. Horne.

A-34—Economies of Scale and Factors Affecting Variations in Cost of Processing Fruits and Vegetables in Maryland. D. J. Burns and L. C. O'Day.

Department of Agricultural Education

T-2—How Farmers Become Established. A. M. Ahalt and R. A. Murray.

T-3—Equipment Needed for Vocational Agriculture Laboratory Activities. A. M. Ahalt and R. A. Murray.

T-4—The Role of Educational Campaigns in Removing Safety Hazards from Farms. H. Palmer Hopkins and A. M. Ahalt.

Department of Agricultural Engineering

R-11-d—Tobacco Housing. R. W. Carpenter, G. J. Burkhardt, P. N. Winn, Jr., E. W. Martin and O. E. Street.

R-11-e—Structures and Equipment for Tobacco Stripping. R. W. Carpenter, G. J. Burkhardt, P. N. Winn, Jr., E. W. Martin and O. E. Street.

R-16—Pneumatic Handling of Chopped Forage. R. W. Carpenter, G. J. Burkhardt, A. V. Krewatch, K. E. Felton, E. W. Martin and J. E. Foster.

R-17—Drying Shelled Corn with Unheated Air in Maryland. G. J. Burkhardt, E. W. Martin, P. N. Winn and R. G. Rothgeb.

R-18—Development of Equipment and Improved Methods for Harvesting Sweet Potatoes. L. F. George, G. J. Burkhardt, L. E. Scott and F. C. Stark.

Department of Agronomy

B-43—Soybean Culture and Varietal Improvement. R. C. Leffel and R. G. Rothgeb.

B-44—Sweet Corn Improvement. R. G. Rothgeb and staff assistants.

B-50—Breeding for Better Dent Corn. R. G. Rothgeb and staff assistants.

B-56-a—Red Clover Improvement. A. M. Decker, Jr.

B-56-g—Ladino Clover Breeding. T. S. Ronningen.

B-56-i—Breeding Orchard Grass for Maryland. T. S. Ronningen.

B-56-j—Pasture Species for Beef Production. A. M. Decker, Jr., and J. E. Foster.

B-56-l—Variety and Strain Testing of Forage Legumes and Grasses in Maryland. T. S. Ronningen and A. M. Decker, Jr.

B-56-m—Seedling Establishment and Management of Legumes and Grasses. A. M. Decker, Jr., and N. A. Clark.

B-56-n—Alfalfa and Alfalfa-Orchard Grass Management. A. M. Decker, Jr.

B-56-o—Management and Fertilization of Established Grass and Grass-Legume Mixtures. A. M. Decker, Jr., and Mitchell Thompson.

B-58-c—Weed Control in Legumes. R. E. Wagner, J. A. Meade, T. L. Bissell and W. C. Hulburt.

B-58-d—Influence of Environmental Factors on the Effectiveness of Several Carbamate Herbicides. P. W. Santelmann, J. A. Meade and Woodland Hurtt.

B-59—Means of Correcting Unfavorable Soil Conditions in Maryland Tobacco Plant Beds. O. E. Street, J. H. Hoyert, O. D. Morgan, Jr., J. E. McMurtrey, Jr., and H. E. Heggested.

B-60—Tobacco Fertilizer Rates and Placement in Relation to Plant Population. O. E. Street, C. G. McKee, J. E. McMurtrey, Jr., and J. H. Hoyert.

B-65—Factors Affecting Water Stability and Porosity of Soil Aggregates. E. Strickling, B. F. Beacher and D. R. Bianco.

B-66—Wheat Improvement for Maryland. R. G. Rothgeb, J. L. Newcomer, J. H. Axley and H. B. Winant.

B-67—Improvement of Small Grains for Feed. R. G. Rothgeb and staff assistants.

B-68—Effect of Rotational Practices Involving Various Legumes on the Growth, Quality and Composition of the Maryland Tobacco. O. E. Street, G. L. Steffens, C. S. Britt, E. G. Nelson and B. L. Grove.

B-69—Breeding for Mildew Resistance in Winter Barley and Wheat. R. G. Rothgeb and student assistants.

N-10—Inspection and Examination of Seeds Produced or Sold in Maryland. J. L. Newcomer, O. M. Kelk, E. P. Emack and A. H. Ferguson.

O-45-b—A Study of the Comparative Availability of Phosphate Materials. J. H. Axley and H. B. Winant.

O-48—Classification and Correlation of Maryland Soils with Special Emphasis on Morphology, Fertility and Conservation and Interdependence of these Factors. G. A. Bourbeau.

O-51—Alfalfa Fertilizer Practices. J. H. Axley, H. B. Winant, J. R. Miller and F. B. Stewart.

O-52—A Study of Soil Tests as an Index of Phosphate Availability to Plants. J. H. Axley, J. R. Miller, J. E. Leggett, H. B. Winant, L. J. Clark and H. E. Gibaly.

O-53—Effects of Soil Physical Factors on Crop Production. E. Strickling, R. G. Rothgeb and J. Axley.

O-54—Mineralogical Studies of Maryland Soils. G. A. Bourbeau, G. Windham and V. Vallessis.

Department of Animal Husbandry

C-14—A Study of the Productiveness of Purebred Beef Cattle in Maryland. W. W. Green, J. E. Foster and John Buric.

C-14-a—Effect of Early Weaning on the Duration of Maternal Influences in Beef Calves. W. W. Green, J. E. Foster and John Buric.

C-14-b—Type Classification as an Aid in Selection of Beef Breeding Cattle. W. W. Green, J. E. Foster and John Buric.

C-14-d—Group Versus Individual Feeding of Weaned Beef Calves. John Buric, J. E. Foster and W. W. Green.

C-20—The Development of Superior Lines of Swine Based on Crossbred or Purebred Foundations. W. W. Green, J. E. Foster, F. C. Wingert and J. H. Zeller.

C-21—The Effect of Specific Metabolites Upon Growth Rate and General Condition of Sheep. E. C. Leffel, J. E. Foster and J. C. Shaw.

C-23—A Study of the Effects of Source of Protein and Level of Protein on Reproductive Performance and Carcass Quality of Gilts. F. C. Wingert, S. H. Fowler, W. W. Green, J. E. Foster and J. R. Sperry.

C-24—A Study of the Control of Large Intestinal Roundworms in Swine. F. C. Wingert, W. W. Green, J. E. Foster and J. R. Sperry.

Department of Animal Pathology

D-46—Investigations on Brucellosis of Cattle. A Study of the Protective Quality of Blood Serum on the Development of Brucella—Infected Embryonating Eggs. Cornelia M. Cotton and Carolyn B. Swann.

D-50—Anaplasmosis of Cattle. Herd Surveys by Counties in Maryland. L. J. Poelma and A. C. Johnson.

D-52—Newcastle Disease Investigations with Particular Reference to Vaccine Modifications and Virus Study. R. L. Reagan, Sing Chen Chan and Frances S. Yancey.

D-53—A Study of Rumen Fermentation and Ruminant Metabolism with Emphasis on Their Relation to Ketosis. R. B. Johnson.

D-55—Investigations with Infectious Enterohepatitis (Blackhead) of Turkeys. H. M. DeVolt, Anita P. Holst and A. R. Gabuten.

D-56—Experiments with Erysipelas in Turkeys. H. M. DeVolt, Anita P. Holst and A. R. Gabuten.

Department of Botany

F-12—The Native Plants of Maryland, Their Occurrence, Distribution and Economic Importance. R. G. Brown.

F-15-b—Spontaneous and Induced Multiple Seedlings and Haploids of *Zea Mays Capsicum Frutescens* and Other Economic Plants and Their Use in Plant Breeding. D. T. Morgan, Jr., R. D. Rappleye and J. R. Brennan.

F-16—Cytological and Genetical Studies in Ornamental and Crop Plants. D. T. Morgan, Jr., R. D. Rappleye, P. Price, J. R. Brennan and M. M. Herron.

J-86-a—The Nature and Control of Sweet Potato Diseases Occurring in Maryland, Including Studies on Significance of Microbiological Antagonism. J. G. Kantzes, C. E. Cox, W. F. Jeffers and graduate assistants.

J-91—Evaluation of Fungicides for the Control of Diseases of Vegetable Crops. C. E. Cox, H. D. Sisler, L. O. Weaver, H. S. Potter and graduate assistants.

J-92—Development of Antibiotic Substances for Control of Plant Pathogenic Organisms. W. F. Jeffers, C. E. Cox, H. D. Sisler, B. Morse and graduate assistants.

J-93—Treatment of Soil and Underground Parts of Plants for the Control of Plant Diseases. O. D. Morgan, W. R. Jenkins and assistants.

J-94—Selection and Development of Disease Resistant Varieties of Potatoes for Use in Maryland. C. E. Cox, H. S. Potter, J. G. Kantzes, L. O. Weaver and graduate assistants.

J-95—Development of Improved Strains of Maryland Tobacco Resistant to Diseases. O. D. Morgan, O. E. Street, H. E. Heggested and assistants.

J-96—Occurrence, Distribution, Biology and Non-Chemical Control of Plant Parasitic Nematodes in Maryland. W. R. Jenkins, D. P. Taylor, R. A. Rohde and B. W. Coursen.

K-8-c—The Role of Trace Elements in Plant Nutrition. H. G. Gauch, R. W. Krauss, John Ambler and George Harrison.

Department of Dairy Husbandry

G-34—Chemical Changes in Milk Fat as Related to the Flavor of the Milk. Mark Keeney.

G-35—The Analysis of Dairy Products. Mark Keeney, W. S. Arbuckle and R. Bassette.

G-37—Ketosis and Parturient Paresis in Dairy Cows. J. C. Shaw, R. A. Gessert, A. C. Chung, G. Bajwa and G. H. Beck.

G-38—The Physiology of Milk Secretion. J. C. Shaw, M. E. Senger, R. R. Robinson, S. Lakshmanan, T. R. Lewis and G. H. Beck.

G-39—A Study of Factors Affecting the Availability and Utilization of Nutrients in Feeds and Their Influence Upon Body Composition, Growth and Milk Secretion. R. F. Davis, J. C. Shaw, R. N. Doetsch, G. Hueter, R. J. Gibbons, J. A. Speicher, R. Q. Robinson, P. Jurtshuk and J. J. McNeill.

G-40—Influence of High Temperature Heat Treatment on Certain Physical and Chemical Properties of Milk. J. F. Mattick.

G-42—Methods of Processing and Other Factors Affecting the Quality of Ice Cream. W. S. Arbuckle, D. J. Seely and N. H. Traylor.

G-43—The Metabolism of Acetate, B-hydroxybutyric Acid, Glucose and Other Carbon Compounds in Lactating Ruminants. J. C. Shaw, S. Lakshmanan and A. C. Chung.

G-44—The Effect of the Farm Holding Tank Milk Procurement System Upon the Keeping Quality of Market Milk. J. F. Mattick.

G-46—The Relationship of the Hypophyseal Growth Hormone and of the Pituitary-Adrenal System to the Productive Capacity of Dairy Cattle for Reproduction and Milk Production. J. C. Shaw, A. C. Chung, T. R. Lewis and W. Chang.

G-47—Nutritive Evaluation of Forages. R. F. Davis, G. H. Beck and A. M. Decker, Jr.

G-48—Flavor Quality of Concentrated Milk Products as a Factor in Milk Utilization and Marketing. Mark Keeney and R. Bassette.

GC-45—A Study of the Causes and Prevention of Bloat in Ruminants. (In cooperation with Department of Animal Husbandry) J. C. Shaw, D. R. Jacobson, E. C. Leffel, R. N. Doetsch, J. J. McNeill, R. Gibbons, P. Jurtshuk, Jr., and G. H. Beck.

Department of Entomology

H-29-k—The Drosophila Problem in the Canning of Tomatoes. W. E. Bickley and L. P. Ditman.

H-29-l—Chemical Control of Bean Insects: Evaluation of Commercial Treatments and Investigations of New Insecticides. L. P. Ditman and F. P. Harrison.

H-29-m—Chemical Control of Insect Pests of Sweet Corn. F. P. Harrison and L. P. Ditman.

H-35-a—Nursery Insects. The Euonymus Scale. E. N. Cory and Henry Highland.

H-35-b—Nursery Insects. Control of the Boxwood Psyllid *Psylla Buxi* (L) E. N. Cory and Henry Highland.

H-35-c—Nursery Insects. Pests of Holly. E. N. Cory and Henry Highland.

H-40-a—Biology and Control of Tobacco Insects. Sub. 1. The Tobacco Horn Worm. H. S. McConnell.

H-40-b—Biology and Control of the Green Peach Aphid on Tobacco. H. S. McConnell.

H-43—Biology and Control of the European Corn Borer. H. S. McConnell.

H-46-d—Studies on the Efficiency of Fixed Boom Low Volume Sprayers. L. P. Ditman, C. E. Cox and G. J. Burkhardt.

H-46-e—To Develop a Quick and Approximate Method for Determining Presence of Insecticides on Fresh Crops for Processing. L. P. Ditman and W. E. Bickley.

H-48—Control of the Codling Moth. E. N. Cory, Castillo Graham and E. R. Krestensen.

H-50—The Biology and Control of the Pests of Commercial Floriculture. The Control of Orchid Pests. E. N. Cory and Henry Highland.

H-55—Control of Peach Insects. E. N. Cory, Castillo Graham and E. R. Krestensen.

H-56—Patuxent Project on the Effect of Soil Conservation Upon Insect Populations. E. N. Cory, H. B. Owens and L. P. Ditman.

H-58—A Taxonomic Study of the Coccid genus *Toumeyella* and Some Closely Related Genera. H. S. McConnell.

H-59—Bionomics of Some Freshwater *Aedes* Mosquitoes in Maryland. W. E. Bickley and J. T. Whitlow, Jr.

H-60—Biology and Control of Nut Weevils. W. T. Johnson and E. N. Cory.

H-61—The Biology and Distribution of *Macropsis Trimaculata* Fitch. E. N. Cory, Castillo Graham and E. R. Krestensen.

H-62—Alfalfa Weevil: Life and Seasonal History, Ecology and Control. E. N. Cory and D. G. Kissinger.

H-63—Ecological Studies of Mosquitoes in Freshwater Impoundments in Maryland. W. E. Bickley, J. T. Whitlow, Jr., R. A. Boettcher and graduate students.

H-64—An Evaluation of the Effectiveness of Commercial Insect Control Practices on Canning Crops. L. P. Ditman.

H-65—Formulation of Sprays for the Home Garden. L. P. Ditman and F. P. Harrison.

H-66—The Effectiveness of Some Chlorinated Organic Insecticides When Applied to the Soil. L. P. Ditman, Harold Gibson and F. P. Harrison.

H-68—An Annotated List of Nemic Parasites of Insects. W. T. Johnson.

Department of Home Economics

Y-1—The Utilization of Protein by Normal College Women. Pela Braucher, H. W. Nilson, Virginia Dawson, Helen Thompson and graduate assistants.

Department of Horticulture

BOQR-83—Engineering, Soil and Plant Aspects of Supplemental Irrigation. (In cooperation with Agronomy and Agricultural Engineering Departments) J. H. Axley, Edward Strickling, O. E. Street, M. L. Blanc, R. E. Wagner, K. E. Felton, G. J. Burkhardt, C. W. Reynolds and F. C. Stark.

I-74-a—Effect of Environmental Factors and Cultural Practices on the Growth and Flowering of Hydrangeas and Azaleas. J. B. Shanks and C. B. Link.

I-74-b—Effect of Environmental Factors and Cultural Practices on the Growth and Flowering of Greenhouse Cut Flower Crops. C. B. Link and J. B. Shanks.

I-79-h—The Relationship of the Mineral Nutrients and of Nutrient Levels to the Growth and Flowering of the Azalea Under Greenhouse Conditions. C. B. Link and J. B. Shanks.

I-79-i—The Balance and Intensity of Inorganic Nutrient Elements as they Affect the Growth, Flowering and Quality of *Hydrangea Macrophylla* Thunb. Under Greenhouse Conditions. J. B. Shanks and C. B. Link.

L-73—Adaptation of Fruit Varieties and New Seedlings to Maryland. I. C. Haut, F. J. Lawrence, D. H. Britton, J. W. Hull and A. H. Thompson.

L-74—Environmental Factors and Cultural Practices in Relation to the Growth and Fruiting Responses of Fruits. A. H. Thompson, L. E. Scott, F. J. Lawrence, B. L. Rogers, S. H. Todd and I. C. Haut

L-74-b—Chemical Thinning of Apples and Peaches. A. H. Thompson, B. L. Rogers and E. A. Stahly.

L-79-a—Mineral Nutrition of the Strawberry with Particular Reference to Effects of Calcium, Potassium and Magnesium on Growth and Fruiting. L. E. Scott, I. C. Haut, A. A. Piringer and Ralph Ruppenthal.

Q-58-f—Develop Objective and Easily Applied Measures of Quality Factors Involved in Market Grades and Standards. A. Kornetsky, Amihud Kramer, D. V. Schlimme, L. E. Scott, Eugenia Sokolov, H. S. Todd, W. Tolby, R. C. Wiley, W. Anderson and A. Sidwell.

Q-58-k—Development of Specifications for Canned Food Quality. R. C. Wiley, Amihud Kramer and assistants.

Q-58-m—Flavor Evaluations by Taste Test Panel Methods. R. C. Wiley, Amihud Kramer, L. P. Ditman and F. L. Harrison.

Q-58-n—Suitability of New Varieties of Horticultural Crops for Canning and Freezing. B. A. Twigg, W. L. Hollis, F. C. Stark, Amihud Kramer, L. E. Scott, R. C. Wiley, W. A. Matthews and H. S. Todd.

Q-58-p—Improvement in the Quality of Canned Apple Slices and Sauce Through Studies of Processing Treatments and Chemical Constituents. R. C. Wiley, A. H. Thompson, Amihud Kramer and assistants.

Q-74—A Study of Regional Adaptation of Certain Vegetable Crops and Varieties in Maryland. F. C. Stark, C. W. Reynolds, W. L. Hollis, R. J. Snyder, W. A. Matthews, A. A. Duncan and B. A. Twigg.

Q-77—Crop Management Studies with Vegetable Crops. F. C. Stark, C. W. Reynolds, W. A. Matthews, W. L. Hollis, and R. R. Dedolph.

Q-79-b—The Mineral Levels and Interrelationships of Mineral Nutrients in Fruit Plantings in Maryland. L. E. Scott, A. H. Thompson, B. L. Rogers, I. C. Haut and D. Rejali.

Q-79-c—Influence of Nutrient Intensity and Balance on the Quality and Physiological Defoliation of Cantaloupes. F. C. Stark, W. A. Matthews and C. W. Reynolds.

Q-79-e—Influence of Nutrient Intensity and Balance Upon the Yield and Quality of Tomatoes. F. C. Stark, Amihud Kramer, W. A. Matthews, C. W. Reynolds and S. H. Todd.

Q-79-f—Mineral Nutrition of the Sweet Potato with Special Reference to Cation Interrelationships. L. E. Scott, A. A. Duncan and F. C. Stark.

Q-79-g—Changes in Chemical Composition of the Sweet Potato During Development, Storage and Processing as Related to Quality of the Final Product. L. E. Scott, W. A. Matthews, Essam Ahmed and F. C. Stark.

Q-79-h—Influence of Nutrient Intensity and Balance on the Growth Yield and Quality of Cauliflower. C. W. Reynolds and F. C. Stark.

Q-8I—Cantaloupe Breeding and Selection with Particular Reference to Quality and Resistance to Defoliation. F. C. Stark.

Q-81-b—Sweet Potato Breeding and Selection with Particular Reference to Quality and Resistance to Cracking. F. C. Stark, W. A. Matthews, L. E. Scott and C. W. Reynolds.

Q-82—Tomato Breeding and Selection with Particular Reference to Greater Resistance to Cracking and to Late Blight. F. C. Stark.

Q-84—Effect of Modified Atmosphere Upon the Storage Behavior of the Sweet Potato. L. E. Scott and W. A. Matthews.

QH-58-o—Evaluation of Possible Off-Flavors Resulting from the Application of Chemicals on Soils and Growing Crops. L. P. Ditman, F. L. Harrison, Amihud Kramer, M. Modery, S. H. Todd and R. C. Wiley. (In cooperation with Department of Entomology).

Department of Poultry Husbandry

M-32-l—Study of Factors Influencing or Controlling the On-Set of Molt. C. S. Shaffner, Paul Harris and Mary Juhn.

M-33-e—Differences in Thyroid Activity as Related to Strain Differences in Growth, Feed Utilization and Feathering. C. S. Shaffner, H. L. Bumgardner, F. L. Cherms and F. H. Wilcox, Jr.

M-33-i—Development of a Flightless Strain of New Hampshire Chickens. C. S. Shaffner and G. D. Quigley.

M-33-j—Fertility Studies with Chickens and Turkeys. F. H. Wilcox and C. S. Shaffner.

M-34-e—Selective Breeding of Medium Sized Turkeys for Improvement of Economic Qualities, C. S. Shaffner and G. D. Quigley.

M-35-g—The Requirement of the Growing Chick for Newer Members of the Vitamin B Complex. G. F. Combs, W. C. Supplee, O. D. Keene and G. L. Romoser.

M-35-i—Amino Acids in Poultry Nutrition. G. F. Combs, G. L. Romoser, W. E. Donaldson, D. F. Middendorf and E. J. Robel.

M-35-l—Development of Improved Rations and Feeding Methods for Broiler Production. G. F. Combs, G. L. Romoser, W. E. Donaldson, W. C. Supplee, J. L. Nicholson and E. L. Robel.

M-45—New Studies on the Causative Effects of Wheat in Pullet Disease. G. D. Quigley and H. M. DeVolt.

M-46—Market Quality of Eggs as Influenced by Antibiotic Treatments. G. L. Romoser and L. E. Elliott.

M-47—Antibiotics, Arsenicals and Related Compounds in Poultry Nutrition. G. L. Romoser, G. F. Combs and D. L. Blamberg.

M-48—Microbiological Studies Pertaining to Poultry Nutrition. Mary S. Shorb and Pauline Lund.

M-49—Vitamin B_{12} and Chick Nutrition. Mary S. Shorb and Unabel Boggs.

Department of Sociology

S-3—Studies in the Population of Maryland. W. C. Rohrer, R. K. Hirzel and T. C. Scott.

S-3-1—Population Change in Maryland and the Northeast. W. C. Rohrer, R. K. Hirzel, D. M. Lewis, and T. C. Scott.

S-4—Studies in Social Organization with Application to the Maryland Agricultural Extension Service. W. C. Rohrer and Mrs. Jewel Fessenden.

Station Staff

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G. J. Burkhardt, M.S., Res. Prof. Agr. Engin.
K. E. Felton, B.S., Res. Asst. Prof. Agr. Engin.
L. F. George, B.S., Instr. Agr. Engin.
F. V. Matthews, M.S., Asst. Prof. Agr. Engin.
P. N. Winn, B.S., Res. Asst. Prof. Agr. Engin.

AGRONOMY

R. E. Wagner, Ph.D., Prof. and Head of Dept.
J. H. Axley, Ph.D., Assoc. Prof. Soils
F. L. Bentz, Ph.D., Asst. Prof. Soils
G. A. Bourbeau, Ph.D., Assoc. Prof. Soils
A. M. Decker, Jr., Ph.D., Asst. Prof.
R. C. Leffel, Ph.D., Agent (Coop. U.S.D.A.)
J. A. Meade, M.S., Instr. Crops
T. S. Ronningen, Ph.D., Assoc. Prof. Crops
R. G. Rothgeb, Ph.D., Res. Prof. Crops
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O. E. Street, Ph.D., Prof. Tobacco
Edward Strickling, Ph.D., Asst. Prof. Soils
T. C. Tso, Ph.D., Res. Assoc. (Coop. U.S.D.A.)
H. B. Winant, M.S., Res. Asst. Prof. Soils

ANIMAL HUSBANDRY

J. E. Foster, Ph.D., Prof. and Head of Dept.
John Buric, M.S., Asst. Prof. An. Husb.
W. W. Green, Ph.D., Prof. An. Husb.
E. C. Leffel, Ph.D., Prof. An. Husb.
F. C. Wingert, Ph.D., Asst. Prof. An. Husb.

ANIMAL PATHOLOGY

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Cornelia M. Cotton, Ph.D., Agt. (Coop. U.S.D.A.)
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O. D. Morgan, Ph.D., Asst. Prof. Botany
H. S. Potter, M.S., Instr. Plant Path.
R. D. Rappleye, Ph.D., Asst. Prof. Botany
L. O. Weaver, Ph.D., Prof. Plant Path.

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W. S. Arbuckle, Ph.D., Prof. Dairy Mfg.
A. C. Chung, M.S., Res. Asst. Dairy Husb.
R. F. Davis, Ph.D., Asst. Prof. Dairy Husb.
Mark Keeney, Ph.D., Assoc. Prof. Dairy Mfg.
J. F. Mattick, Ph.D., Assoc. Prof. Dairy Mfg.
H. A. Newlander, B.S., Asst. Inspr. Dairy Husb.
J. C. Shaw, Ph.D., Prof. Dairy Husb.

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Castillo Graham, Ph.D., Assoc. Prof. Ent.
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E. R. Krestensen, M.S., Instr. Ent.
H. S. McConnell, M.S., Res. Assoc. Prof. Ent.

HOME ECONOMICS

Pela F. Braucher, M.S., Assoc. Prof. Foods and Nut.

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D. M. Britton, Ph.D., Asst. Prof. Pomology
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W. L. Hollis, M.S., Instr. Veg. Crops
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C. B. Link, Ph.D., Prof. Flor.
W. A. Matthews, M.S., Assoc. Prof. Veg. Crops
C. W. Reynolds, Ph.D., Asst. Prof. Veg. Crops
L. E. Scott, Ph.D., Prof. Hort. Phys.
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F. C. Stark, Jr., Ph.D., Prof. Veg. Crops
A. H. Thompson, Ph.D., Prof. Pomol.
S. H. Todd, B.S., Instr. Hort.
R. C. Wiley, Ph.D., Asst. Prof. Hort. Processing

POULTRY

C. S. Shaffner, Ph.D., Prof. and Head of Dept.
G. F. Combs, Ph.D., Prof. Poultry Nut.
Mary Juhn, Ph.D., Res. Prof. Poultry Phys.
G. D. Quigley, B.S., Assoc. Prof. Poultry Husb.
G. L. Romoser, Ph.D., Asst. Prof. Poultry Nut.
Mary S. Shorb, Sc.D., Res. Prof. Poultry Nut.
W. C. Supplee, Ph.D., Res. Asst. Poultry Nut.
F. H. Wilcox, Ph.D., Asst. Prof. Phys.

SEED INSPECTION

J. L. Newcomer, M.S., Asst. Prof. Seed Program

SOCIOLOGY

W. C. Rohrer, M.S., Asst. Prof. Sociology
R. K. Hirzel, Ph.D., Instr. Sociology

Changes In Personnel

Appointments

A. C. Chung, M.S., Res. Asst. Dairy Husbandry, December 1, 1955
R. K. Hirzel, Ph.D., Instructor, Sociology, February 1, 1956
Sidney Ishee, M.S., Assistant Professor, Agricultural Economics, February 1, 1956
F. V. Matthews, M.S., Assistant Professor, Agricultural Engineering, September 16, 1955
L. C. O'Day, M.S., Research Assistant, Agricultural Economics, February 1, 1956
R. J. Snyder, Ph.D., Assistant Professor, Horticulture, July 1, 1955
R. E. Wagner, Ph.D., Professor and Head, Agronomy, April 1, 1956
F. H. Wilcox, Ph.D., Assistant Professor, Poultry, September 1, 1955
F. C. Wingert, Ph.D., Assistant Professor, Animal Husbandry, November 15, 1955

Resignations

G. L. Beck, Ph.D., Professor and Head, Dairy Husbandry, May 19, 1956
H. I. Brigham, Jr., M.S., Research Assistant, Horticulture, March 15, 1956
D. J. Burns, M.S., Assistant Professor, Agricultural Economics, February 15, 1956
S. H. Fowler, Ph.D., Assistant Professor, Animal Husbandry, July 15, 1955
W. F. Jeffers, Ph.D., Professor, Botany, August 31, 1955
M. A. Jull, Ph.D., Professor and Head, Poultry Husbandry, August 31, 1955
A. O. Kuhn, Ph.D., Professor and Head, Agronomy, July 1, 1955

FINANCIAL STATEMENT - July 1, 1955 to June 30, 1956

	Federal Funds			
	Amended Hatch	Regional Research	Agr. Marketing Title II	
	$ 469.23	$	$ 1,455.41	
Appropriation 1955-1956	281,864.62	67,190.00	13,650.00	
Totals	282,333.85	67,190.00	15,105.41	
Receipts from sources other than Federal 1955-56				**For Agr. Investigations***
State Appropriations for Agricultural Investigations				$498,229.02
Special Endowments, Fellowships and Grants				86,392.38
Sales and Miscellaneous				128,231.52
				712,852.92
Balance brought forward July 1, 1955				114,363.54
Total				$827,216.46
Expenditures:				
Personal Services	175,756.95	36,801.17	10,246.86	494,979.65
Travel	10,564.22	1,993.44	1,805.35	12,243.78
Transportation	222.95	76.32		748.36
Communication Service	306.20	137.17	23.90	2,288.61
Rents and Utility Services	200.32	373.27		5,751.52
Printing and Reproduction	1,176.78	336.48	1,113.92	4,002.52
Other Contractual Services	7,424.65	5,755.92	96.37	31,807.07
Supplies and Materials	44,133.86	14,706.22	38.00	138,525.75
Equipment	25,310.25	5,223.83		36,612.72
Lands and Structures	15,179.75			13,231.30
Contributions to Retirement				
	$280,275.93	$65,403.82	$13,324.40	$740,191.28
Balance June 30, 1956	2,057.92	1,786.18	1,781.01	87,025.18
Totals	$282,333.85	$67,190.00	$15,105.41	$827,216.46

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* Including Offset Funds

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